Published Monthly By
THE INDUSTRIAL PRESS
48 Lafayette St., New York 13, N. Y.

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Subscription Rates: United States and Canada, one year, $4; two years, $7; three years, $8; foreign countries, $7 a year. Single copies, 40 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address. Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America.

British Address:
National House, West St.
Brighton 1, England

Total Distribution
for July, 23,125

ABC

MACHINERY

VOLUME 55 AUGUST, 1949 NUMBER 12

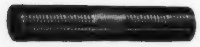
The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

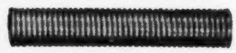
SHOP PRACTICE

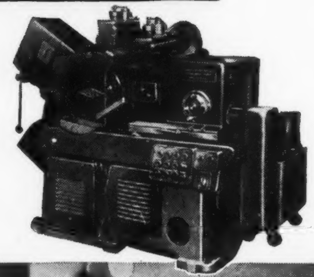
MACHINE AND TOOL DESIGN

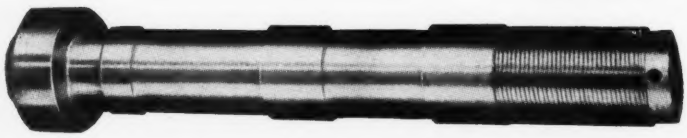
MANAGEMENT PROBLEMS

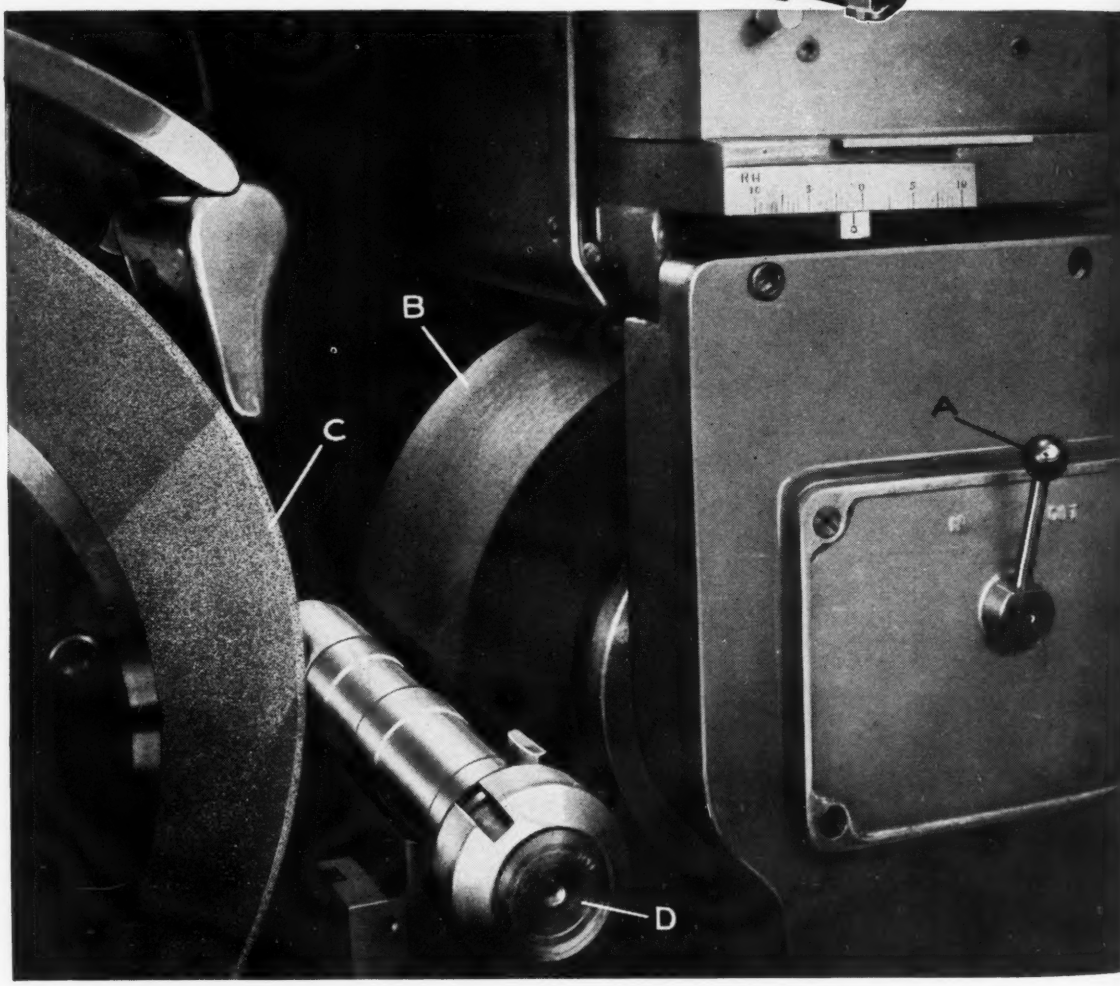
DEPARTMENTS











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MACHINERY
Vol. 55 AUGUST, 1949 No. 12

Business Machines Produced by Modern Methods

By W. C. PFEIFFER, Manufacturing Engineer
Burroughs Adding Machine Co., Detroit, Mich.

SINCE its inception in 1904, the Burroughs Adding Machine Co. has expanded and developed the basic principle of the adding machine into a complete line of bookkeeping, accounting, calculating, and statistical machines. Over a million precision parts for these complex machines are produced per day in the six plants of the company. Outstanding examples of the modern manufacturing methods and equipment used in these plants are described in this article.

The more complex of these business machines contain as many as 10,000 parts. Certain of the parts require production in lots of as many as 10,000,000 a year. More than two hundred automatics are used in the screw machine department to perform various operations on many such parts. Tube and bar stock from 1/16 inch to 2 3/8 inches outside diameter is employed in producing these parts. A multitude of different parts are turned, formed, faced, drilled, threaded, reamed, burnished, and knurled at production rates as high as 250 per hour. Tolerances as close as $\pm$ 0.00025 inch are maintained on certain hole diameters. Typical of the parts made on such machines is the S A E 1112 steel pulley shown at the bottom of Fig. 1, which is completely machined, including the cross-drilling of two holes, at the rate of ninety-eight per hour.

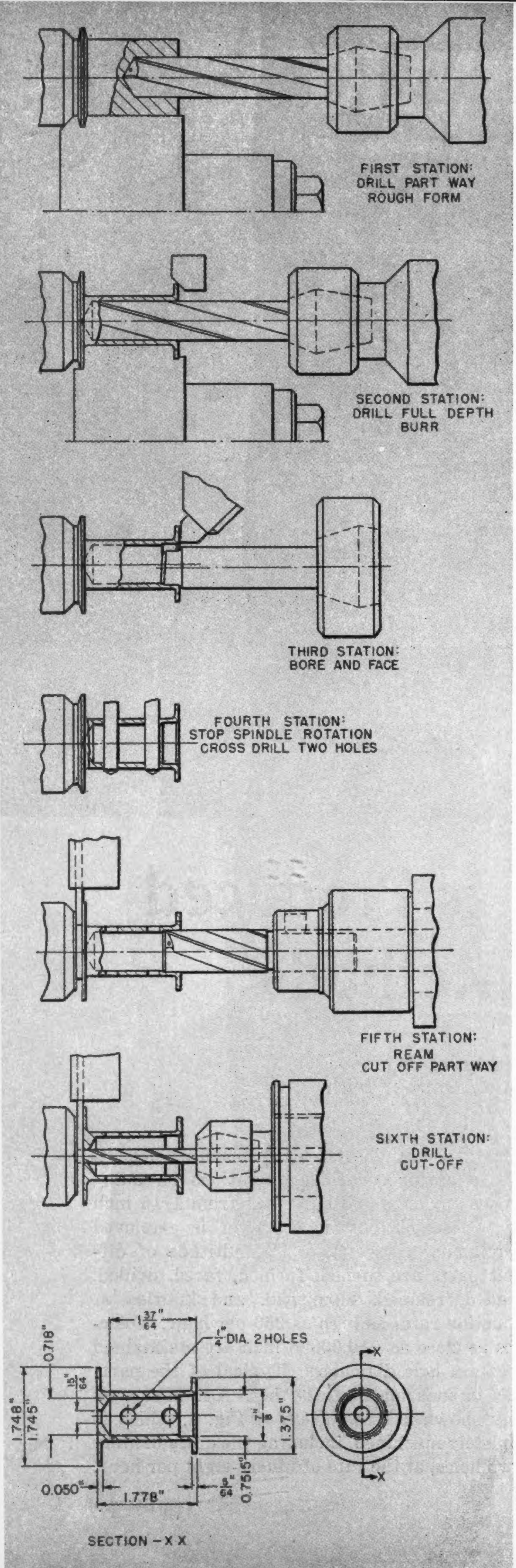


Fig. 1. Successive operations performed on a six-spindle automatic in producing steel pulleys (shown at the bottom) at the rate of 98 per hour

Steel bar stock, 1 3/4 inches in diameter, is fed into a New Britain six-spindle automatic to produce these parts. At the first station, shown at the top of Fig. 1, the bar stock is advanced through the collet until it contacts a retractable stop. Here the bar is rough-turned to a diameter of 1.395 inches with a circular form tool, and a 23/32-inch diameter drill is fed into the bar to a depth of about 3/4 inch. The form tool, mounted on the cross-slide, is fed 0.0013 inch per revolution, while the twist drill, mounted on the tool-slide, is fed by a cam at the rate of 0.005 inch per revolution. A spindle speed of 357 R.P.M. is employed.

When the part has been indexed to the second station, another 23/32-inch drill is employed to deepen the bore to 1 37/64 inches. A circular tool is used to further form the part, and a 5/8-inch square tool bit, mounted on the tool-slide, breaks the outer corner. Spindle speed and drill feed remain the same, but the form tool feed is increased to 0.002 inch per revolution.

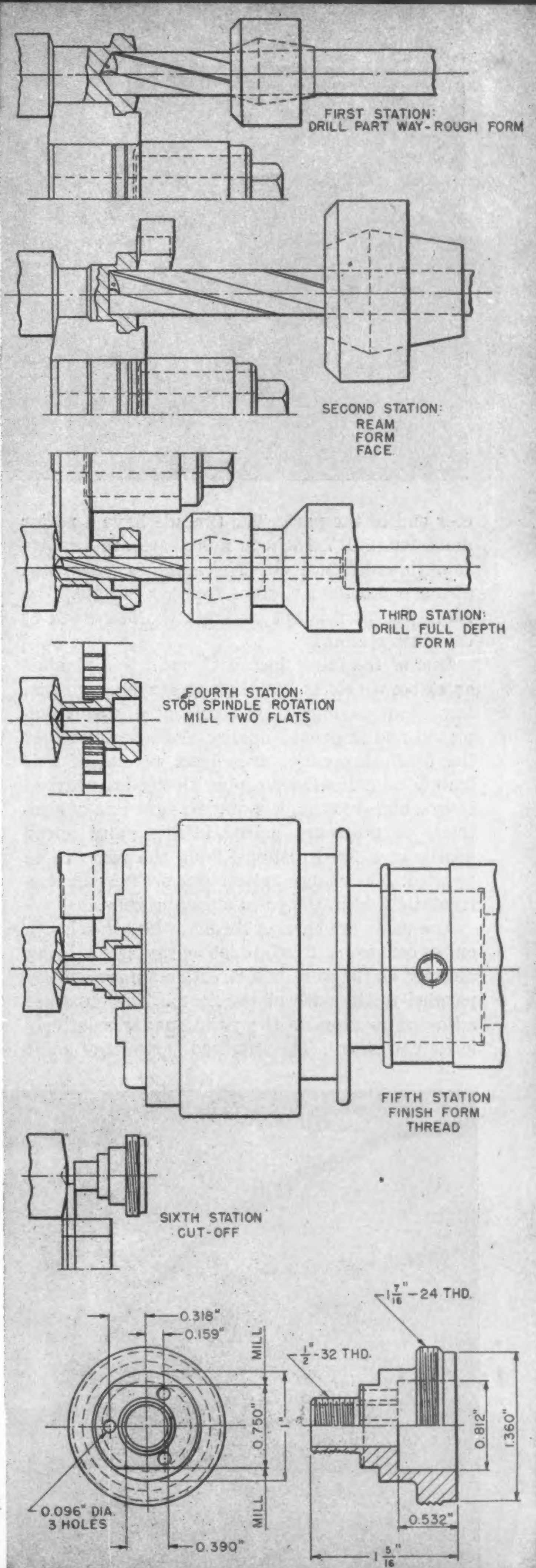
At the third station, the drilled hole is counterbored 3/4 inch in diameter by 5/16 inch deep, and the part is faced with a single-point tool mounted on the cross-slide. The boring tool is fed 0.005 inch per revolution, while the facing tool is advanced 0.0018 inch per revolution.

A secondary operation, usually performed on another machine, is accomplished at the fourth station by employing a spindle stopping mechanism. With the work stationary, two 1/4-inch diameter drills, mounted on a special cross-drilling attachment, are fed at the rate of 0.0017 inch per revolution through the walls of the part.

The counterbored hole is reamed to a diameter of 0.7515 inch, ± 0.0005 inch, at the fifth station. Also, the piece is partially cut off from the bar by a blade, 1/8 inch wide, on the cross-slide. The reamer is fed 0.005 inch per revolution, and the cut-off blade 0.002 inch per revolution. At the sixth station, a drill 15/64 inch in diameter is fed through the left-hand end of the part, and the cutting off is completed. Each part is finished in 201 revolutions or 36 3/4 seconds.

Another interesting job, also performed on a six-spindle New Britain automatic, is the thread-

Fig. 2. Parts such as seen at the bottom are produced at the rate of 114 per hour on an automatic with tooling shown



ing and cross-milling of the part shown at the bottom of Fig. 2. A production of 114 parts per hour is obtained in this operation. Solid S A E 1113 steel bar stock, 1 1/2 inches in diameter, is employing in making this piece.

At the first station, seen at the top of Fig. 2, the bar stock is rough-formed and drilled part way. A spindle speed of 440 R.P.M. is employed at all stations of this machine, except the fourth, resulting in a cutting speed of 173 surface feet per minute when forming the 1 1/2-inch diameter, and 86.5 feet per minute when drilling the 0.750-inch diameter hole. The circular form tool, mounted on the center-front cross-slide, is fed at the rate of 0.0013 inch per revolution, while the drill, mounted on the tool-slide, is fed 0.0047 inch per revolution.

Another circular form tool is employed at the second station, together with a 5/8-inch square tool bit for facing the end of the part, and a reamer for finishing the drilled hole to a diameter of 0.8125 inch. The form tool and facing tool are fed 0.0012 inch per revolution. Semi-finish-forming is accomplished at the third station, and a 0.390-inch diameter hole is drilled through the part.

Rotation of the spindle is stopped when the part has been indexed to the fourth station (see Fig. 3). Here two high-speed steel side milling cutters having an outside diameter of 2 inches and a face width of 3/8 inch are mounted on a special milling attachment to machine two flats on the part. The speed of the milling cutters is 225 R.P.M., and the feed 0.005 inch per revolution.

At the fifth station, the part is finish-formed by a circular form tool on the upper rear slide of the machine, which is fed at the rate of 0.0009 inch per revolution. On a front auxiliary slide at the same station is mounted a die-head for producing the threads on the large-diam-

Fig. 3. Close-up view of fourth, fifth, and sixth stations on the automatic screw machine used to produce part shown in Fig. 2

eter end of the part. The threads have a major diameter of 1 7/16 inch, and there are twenty-four threads per inch. Threading is performed at a speed of 30.5 surface feet per minute. The completed part is cut off from the bar stock at the sixth station.

One of the latest installations in this plant is an elaborate electrostatic paint spraying system. Important savings in the amount of paint employed and improved quality and appearance of the finished product are direct results of this installation. Insulated copper electrodes, charged from a high-voltage, low-amperage source of electrical current, are placed in the paint spray booths at a fixed distance from the parts to be painted. The charged electrodes produce an electrostatic field in the paint spraying zone.

The parts are carried through the spray booth on a conveyor, fixed paint spray guns being directed on the work in a direction approximately parallel to the path of the parts. The guns are adjusted to atomize the paint, under relatively low air pressure. The atomized particles of paint become ionized or charged with static electricity of the same polarity as the electrodes. While moving along the conveyor, the parts to be painted are rotated and charged with an electrical current of opposite polarity. The electrically charged paint particles are attracted to the oppositely charged parts. Thus paint is deposited smoothly and uniformly over the rotating surface of the part, and a minimum amount of overspray reaches the water curtain at the rear of the booth.

Many of the small gears employed in the various business machines are produced from strip stock by a series of press operations. The pitch diameters of such gears are maintained within $\pm$ 0.002 inch, their outside diameters are held to $\pm$ 0.001 inch, and smooth, uniform teeth are produced. Production rates as high as 400 per hour are obtained.

Progressive shapes produced in forming ten-tooth gears having a pitch diameter of 0.664 inch and a diametral pitch of 15 are seen in Fig. 4. Cold-rolled steel strip stock, 0.207 inch thick by

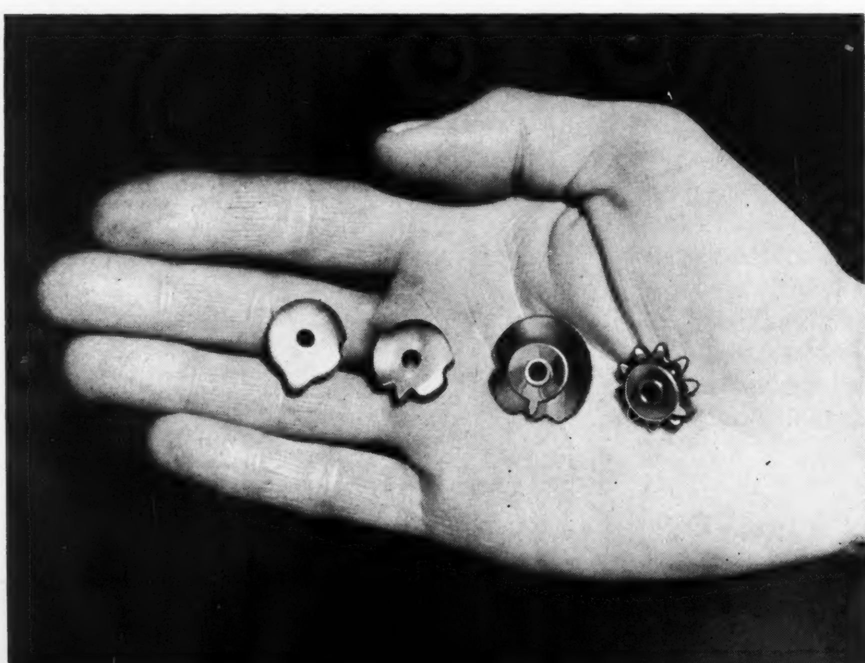


Fig. 4. Some of the progressive steps in the production of ten-tooth gears, having a pitch diameter of 0.664 inch, from steel strip stock 0.207 inch thick

Fig. 5. Teeth are rough-formed on gear blanks in this trimming operation. About 0.013 inch of stock is left on the teeth for shaving

1 1/4 inches wide by 72 inches long, is employed. In the first operation, performed on a progressive die, the developed shape is blanked from the strip, a hole is pierced in the center of the blank, and a locating recess is notched in the periphery of the blank. Eighty blanks are produced from each 6-foot length of material.

Locating from the notched recess in the periphery of the blank, a single tooth is milled on the part. The milled tooth serves to locate the gear blank accurately in a swaging die mounted on a Ferracute 25-ton press. The swaging operation reduces the over-all thickness of the blank to 0.192 inch, and forms a larger diameter hub, 0.083 inch thick, in which the teeth are subsequently produced.

The gear blanks are hardened by the cold-working of the swaging operation, and must be softened by annealing before processing can be continued. After being annealed, the blanks are trimmed in another press operation, Fig. 5, to produce the rough tooth forms. Approximately 0.013 inch of stock must be removed from the peripheries of the trimmed teeth. This is accomplished in two shaving operations on the same type presses as are used for swaging.

Rough-shaving removes about 0.008 inch of stock from the peripheries of the trimmed teeth, and finish-shaving removes 0.005 inch more. Stock removal in gear-shaving on presses is limited to about 10 per cent of the stock thickness. A good finish is produced on the wearing surfaces of the teeth by shaving, and further processing is limited to surface hardening.

Shaving and trimming punches mounted on the beds of the presses, as seen in Fig. 5, flare outward at their bases, so that the scrap rings will be sheared as they are forced downward on the punches. About 15,000 gears are produced by each die before sharpening is required. Each set of three dies is sharpened at one time to insure accuracy of the gear produced.

Multiple slotting of steel shafts has been speeded-up more than 100 per cent with the set-up shown in Fig. 6. The shafts are made from S A E 1113 steel, and are 0.400 inch in diameter

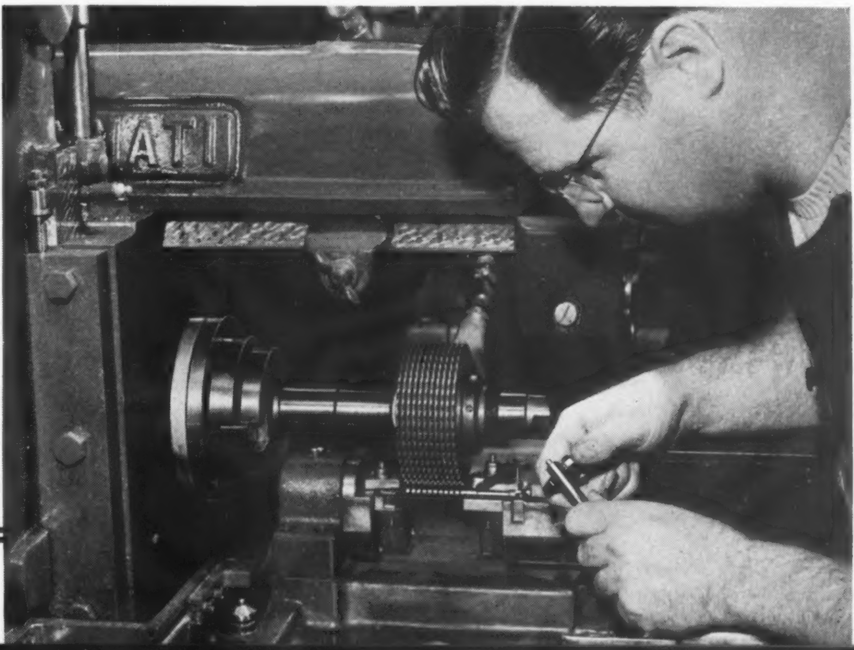


Fig. 6. Slots are milled in steel shafts at the rate of 75 shafts per hour on this automatic milling machine having a hydraulic rise-and-fall attachment

Fig. 7. Thin, intricate-shaped sheet-metal gear segments are selectively hardened at the rate of 500 per hour by the use of an electronic heater

by 4 1/2 inches long. Eleven slots, 0.0625 inch wide by 0.190 inch deep, are milled in each shaft. The slotting operation is complicated by the fact that one end of each slot must be rounded to a 0.097-inch radius.

Slotting was previously accomplished on a hand-fed milling machine, equipped with a hand-operated fixture, at the rate of thirty-five per hour. Now seventy-five shafts are slotted per hour on a Cincinnati automatic milling machine equipped with a hydraulic rise-and-fall attachment. Two work-holding fixtures are provided, one at each end of the table. One fixture is unloaded and reloaded while a shaft in the other is being milled. During the milling operation, the fixture is automatically rotated to develop the desired radius at the end of each slot.

High-speed steel forty-tooth slitting saws, 5 inches in diameter, are used for this operation. Eleven of the saws, properly spaced on the arbor, are rotated at 210 R.P.M. and fed at the rate of 4 3/4 inches per minute. Approximately 4000 shafts are slotted before a set of saws requires sharpening. When this is necessary, a complete set of saws, mounted on an arbor, is substituted for those to be sharpened, so that the operator does not need to alter the spacing. Depth, radius of the rounded end, and spacing between slots is maintained within $\pm$ 0.001 inch.

Thin, intricate-shaped sheet-metal segment gears are induction-hardened at the rate of eight per minute with the set-up shown in Fig. 7. The S A E 1050 steel gear segments are only 0.040 inch thick. Numerous perforations in the piece and its complex contour make it a difficult part to harden without distortion or cracking.

Selective or localized hardening of these parts is necessary, since the bottoms or roots of the teeth must be left soft. This minimizes the danger of the teeth cracking or being pulled away from the part during service. All the teeth are heated simultaneously to approximately 1500 degrees F. in a two-second pre-set automatic cycle on a 15-KW General Electric electronic heater. A water quench, lasting for 2 1/2 seconds, immediately follows the heating cycle. The

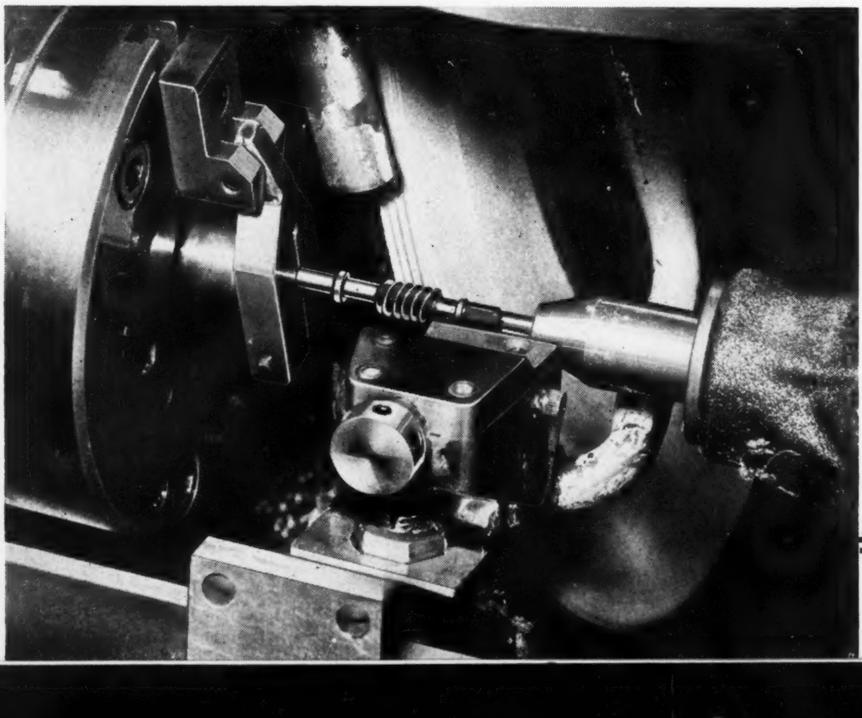


Fig. 8. Double left-hand worm threads are ground from the solid on hardened steel shafts at the rate of 28 worm-shafts per hour

Fig. 9. Four-station boring machine employed to face and precision-bore die-cast aluminum-alloy gear housings at the rate of 25 per hour

tooth hardness averages 60 Rockwell C. An output of nearly 500 parts per hour is obtained from a single induction hardening machine, or about five times the production previously obtained with a lead pot.

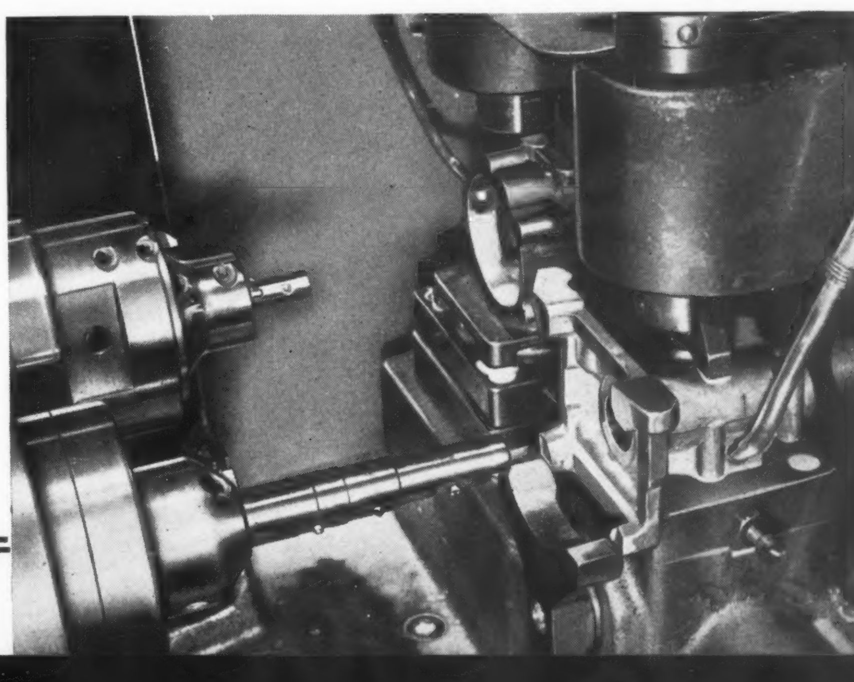
Another interesting set-up is illustrated in Fig. 8. Here a double left-hand worm thread having a lead of 0.2244 inch is ground from the solid on hardened steel shafts at the rate of twenty-eight worm-shafts per hour on a Jones & Lamson automatic thread grinder. In addition to the higher production attained in this operation, greater accuracy and better surface finish are obtained than with previous methods of producing the threads. The worm-shafts are made from S A E 1045 steel, induction-hardened to 63 Rockwell C before thread grinding. The thread has a pitch diameter of 0.3044 inch, and linear pitch is maintained within 0.0005 inch.

About 0.166 inch is removed from the diameter of the hardened shaft in a rough thread-grinding operation, and 0.008 inch more in finish-grinding. For both rough- and finish-grinding, the wheel is advanced to the operating position, after which the work is traversed past the wheel. All the stock is removed at each pass, and no wheel feed is required during grinding. Traverse of the work, to suit the lead of the worm thread, is controlled by change-gears.

A 200-grit, grade-K, vitrified-bond aluminum-oxide wheel, 20 inches in diameter by 3/8 inch wide, is employed for thread grinding. Annular thread-shaped ridges are formed on the face of the grinding wheel by means of a hardened steel crush work roll. It is necessary to crush-dress the wheel after thread grinding about sixty worm-shafts. When the work roll becomes worn, usually after grinding approximately 9000 shafts, the grinding wheel is crush-formed with a master roll. The dressed wheel is then used to grind the work roll.

A grinding wheel speed of 1425 R.P.M. is used for new full-size wheels. When the diameter of the wheel has been reduced by wear, its speed is increased to maintain a surface speed of approximately 7500 feet per minute. The work is

Fig. 10. By using carbide roughing and diamond finishing tools, bores are held within 0.00025 inch of specified size



rotated at a surface speed of 6 feet per minute. Each ground thread is inspected by the operator, using an optical comparator which magnifies the part thirty times.

An active, sulphurized, fatty mineral oil is used as the cutting fluid in the thread-grinding operation. The fluid is maintained at a temperature of 82 degrees F. by passing it through a refrigerating system. Before this system was installed, the fluid sometimes reached a temperature of 120 degrees F., requiring much more frequent dressing of the grinding wheel.

Die-cast aluminum-alloy gear housings are faced and bored to a high degree of precision on the Ex-Cell-O four-station boring machine shown in Fig. 9. Utilizing carbide roughing tools and diamond finishing tools, bearing housings in the part are bored to within 0.00025 inch of the specified dimension. Two of the gear housings are loaded while two others are being machined, resulting in a production of twenty-five parts per hour. Four spindles are mounted in the two stationary heads of the machine, and the four fixtures are held on a hydraulically actuated table.

At the first station, seen at the rear in Fig. 10, a small hole in the casting is bored, a larger hole is counterbored, and two bosses are faced, six tools being employed on one spindle. Two holes are both rough- and finish-bored by two carbide and two diamond tools at the second station, seen in the foreground.

The bottom surfaces of the four pads or feet on the casting are faced by a single-point carbide fly-cutter mounted on the third spindle. The work is reversed before placing it in the fixture at the fourth station. Here two single-point carbide fly-cutters are employed to face two bosses. All four spindles are rotated at 2000 R.P.M. and fed at the rate of 0.010 inch per revolution.

Various sizes of taper pins, which are used in large quantities on the different business machines, are automatically segregated into seven classifications on the electronically controlled DoAll inspection machine seen in Fig. 11. Taper pins ranging in size from 0.052 to 5/32 inch diameter at their large end and from 0.480 to 1 1/4 inches long can be handled on one machine.

Before loading the pins into the hopper of the inspection machine, they are demagnetized and cleaned. The rotary hopper, made by the Detroit Power Screwdriver Co., automatically aligns the pins so that they will slide down the chute to the gaging head with their small ends in front. The pins are moved mechanically, one at a time, from the chute to a V-block. Here a light-pressure, spring-actuated plunger pushes the pin into a carbide tapered ring gage.

As the pin is pressed into the gage under a constant pressure, the distance it enters the gage determines its taper classification. A difference in linear travel into the gage of 1/64 inch represents a difference in the pin diameter of 0.0002 to 0.0003 inch. The machine can be set to segregate pins varying in diameter by 0.0001 inch.

With a pin in the gage, an electrical impulse opens the correct classification drawer under the machine. A second spring-actuated hammer, located at the left-hand side of the gaging head, then pushes the pin from the gage. The pin falls into the open classification drawer, and another pin is picked up from the chute for inspection. The complete cycle is automatic, a production of approximately 4000 pins per hour being obtained.

Fig. 11. Taper pins are automatically segregated into seven different classifications, varying from each other by 0.0001 inch, on this electronic inspection machine

Ball-Broaching Gears and Bushings for Aircraft Engines

By R. C. BARRON
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East Hartford, Conn.

SECURE assembly of bushings in the bores of aircraft engine reduction gears, pinions, and other parts is insured by a "ball-broaching" method used by Pratt & Whitney Aircraft, Division of United Aircraft Corporation, East Hartford, Conn. The ball-broach method was originally developed during World War II as a production operation on the twenty-eight-cylinder, 3500-H.P. "Wasp Major" engine. It provides a means of securing bushings that entirely eliminates the use of pins, keys, splines, and other devices ordinarily required to fasten internal and external parts of this type together.

Essentially, the process consists of pressing through the bore of the part, a tool that contains a number of hardened steel balls located tangent to each other and free to revolve in an annular race, as seen in Fig. 1. The diameter over the outside of the balls is between 0.001 and 0.003 inch larger than the bore of the part to be "ball-rolled," or "ball-broached," and this dimension is held within a tolerance of plus or minus 0.0005 inch. Plastic flow of metal, caused by the rolling action of the balls against the bore surface, produces round-bottomed furrows from 0.0005 to 0.0015 inch deep, and metal is raised from 0.0003 to 0.0005 inch in height above the bore surface at each side of the furrows.

No cutting or shearing action occurs, nor is the broached surface weakened in any way. On the contrary, the cold-working of the surfaces increases the strength and hardness. In the photomicrograph of a ball-rolled specimen shown in Fig. 2, the furrows produced by the displacement of metal can be seen at *A* and the depth of the cold-worked structure at *B*. (In making this photomicrograph, silver plating was used for demonstration purposes.) The crests raised above the surface of the bore on each side of the furrow are indicated at *C*. An important feature of this method is the lack of notch brittleness that often occurs when grooves of this type are

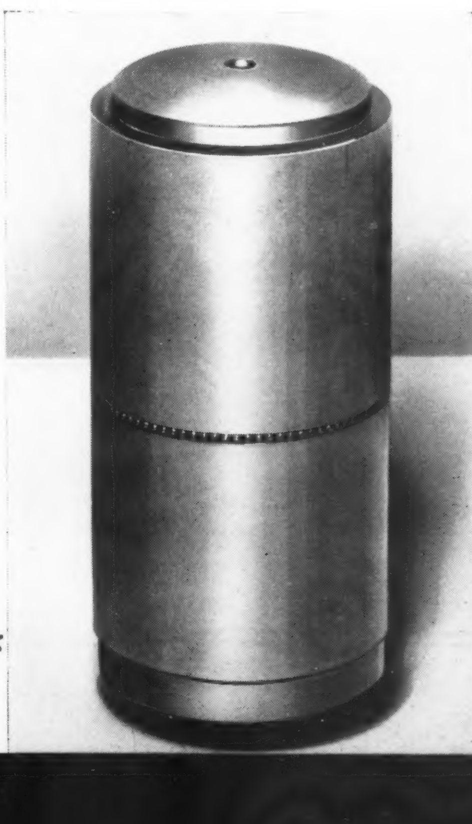


Fig. 1. Ball-rolling tool containing hardened steel balls tangent to each other and free to revolve in an annular ball race

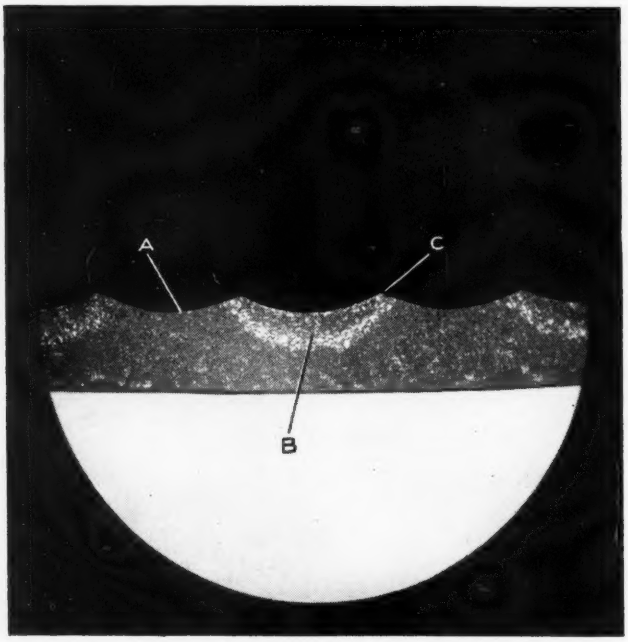


Fig. 2. Photomicrograph of ball-broached section, showing furrows and crests produced by rolling action of balls. Lighter areas at bottom of furrows indicate increased density resulting from ball-broaching

produced by cutting operations. Because of the spherical form of the tool, the grooves or furrows are smooth and free from tool marks, scratches, and other defects that tend to produce points of stress concentration.

Bushings that are relatively softer than the parts into which they are to be assembled are pressed into the broached parts in much the same manner as in ordinary drive fits. However, the amount of diametral interference between the mating parts is slightly less than it would be in the case of a drive fit between smooth cylindrical surfaces. For example, in the latter case, an interference of 0.002 to 0.0035 inch would be suitable for ordinary applications, whereas an interference of only 0.001 to 0.0025 inch is sufficient with the ball-broaching method of anchoring bushings.

When a bushing is pressed into a ball-broached bore, the work-hardened crests in the broached member cause the material in the relatively softer bushing to flow on opposite sides of each crest into the furrows. This forms a rigid tongue-in-groove engagement between the two parts. Fig. 3 illustrates diagrammatically a section of the engagement between two parts assembled after ball-broaching. The outer member is shown at *A* and the inner part at *B*, while the raised crests are indicated at *C*. It can be seen that the crests produce furrows in the bushing, or inner member, and these furrows, like those ball-rolled into the bore of the outer part, are work-hardened and free from flaw producing marks. The elasticity of the bushing material permits the flow of metal from these furrows into those of the outer member, forming, for all practical purposes, an integral unit.

As the ball-broaching tool passes through the work, there is a slight build-up of material in front of each ball, forming a series of smooth steps which prevent axial movement of the assembled bushing as effectively as the furrows prevent radial movement. The resistance to torque offered by the multiple tongue-in-groove

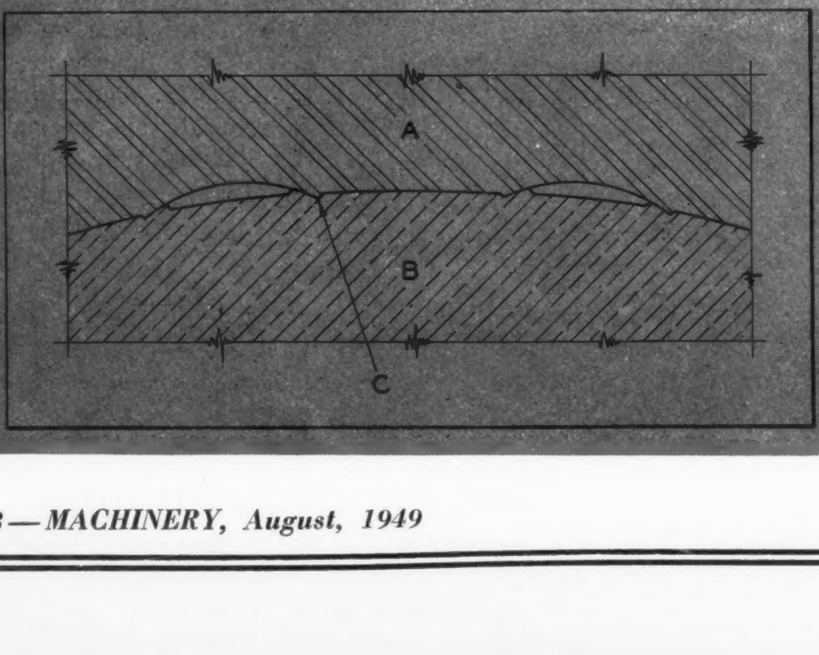


Fig. 3. Diagram showing plastic flow of metal which prevents radial movement between the assembled bushing and gear after the ball-broaching operation

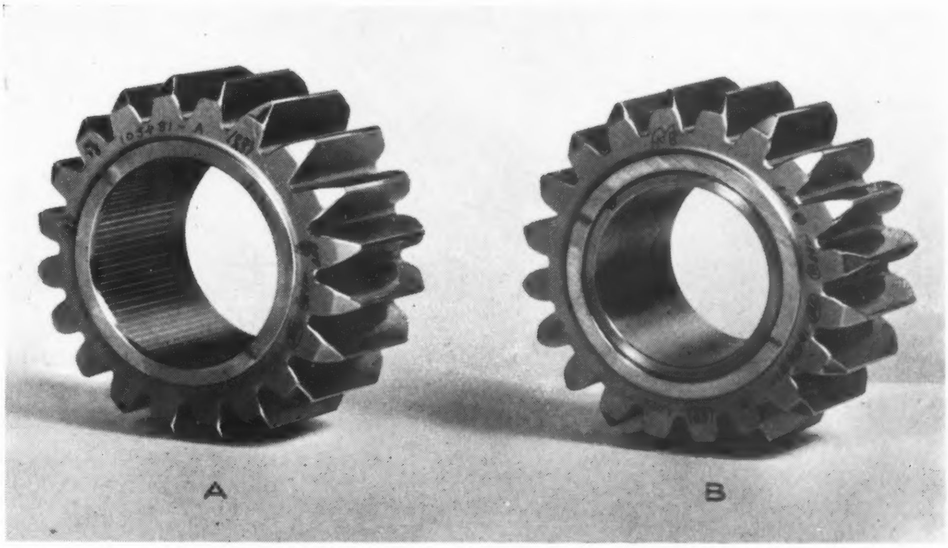


Fig. 4. Typical furrows or grooves ball-broached into a gear bore may be seen at (A), the assembled gear and bushing being shown at (B)

engagement of the bushing with the outer member is distributed over the whole assembly, providing far greater holding power than that obtained by the localized grip of pins or keys.

A typical application of a ball-broached assembly may be seen in Fig. 4, where a broached reduction gear is shown at *A*. The gear, assembled with a tri-metal bushing (steel-backed with a bronze liner having a babbitt surfaced bore), is shown at *B*.

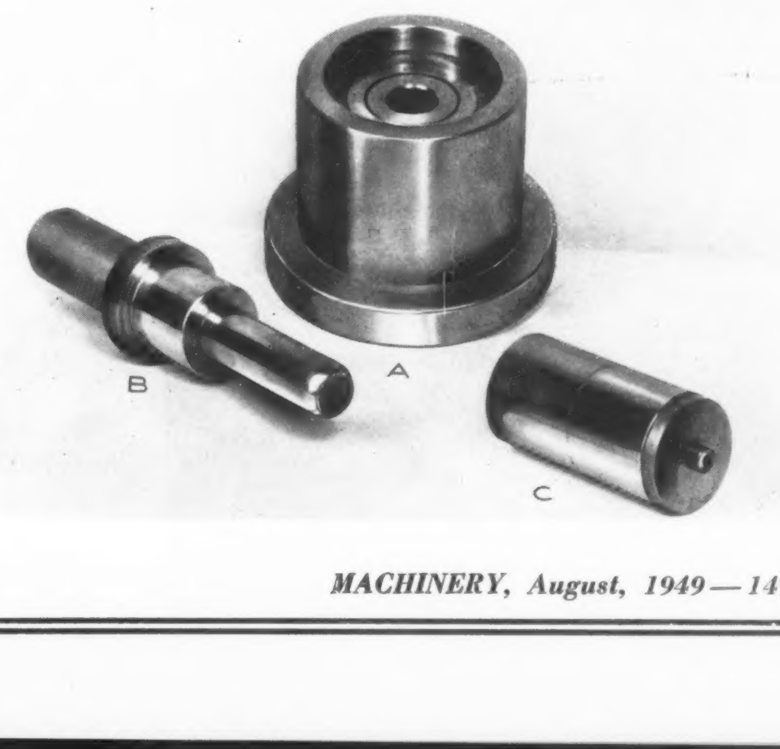
The tools used to broach the gear and assemble the bushing are illustrated in Fig. 5. The work-holder *A* has a recess in which the gear is nested during the broaching and assembling operations. A bored sleeve is inserted in the work-holder which is engaged by a pilot on the arbor *B* during the assembling operation. The arbor is applied, under pressure from an air-operated arbor press, to assemble the bushing after the gear has been broached.

To prevent collapse and to force the bushing wall into the broached furrows in the gear bore, the working diameter of the arbor mates with the inside diameter of the bushing. The broach *C* has a working diameter that fits the bore of the gear within 0.0005 inch and acts as a pilot during the broaching operation.

The bored sleeve is not used, of course, while broaching, as the ball-rolling tool, or broach, must pass through the gear and the holder. A nested gear with the broach in the operating position is illustrated in Fig. 6.

The hardness of the broached part generally does not exceed 45 Rockwell C, although mate-

Fig. 5. Work-holder (A), assembling tool (B), and ball-broach (C) comprise a typical set of ball-broaching tools



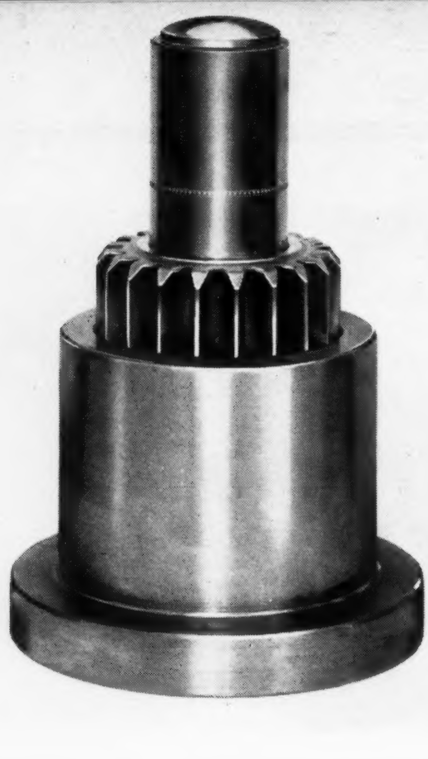


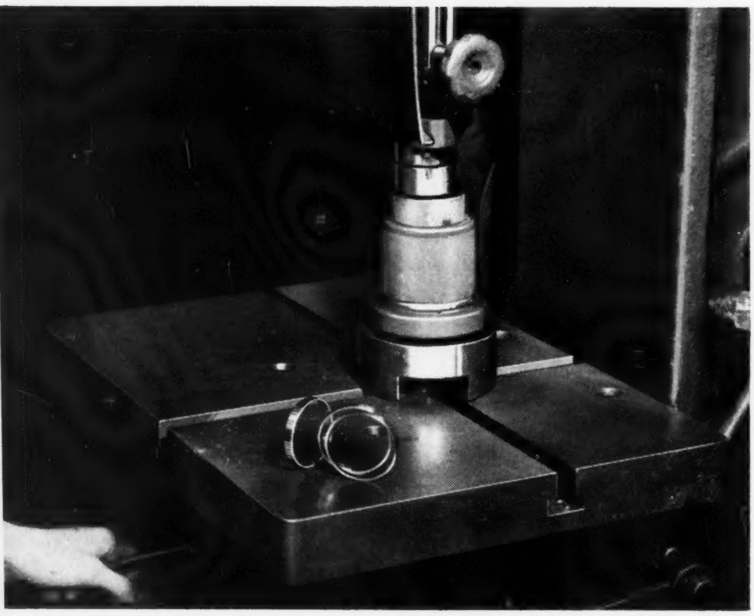
Fig. 6. Ball-broaching tool in operating position. Gear is nested in holder through which the broach is forced by press ram

rials of 50 Rockwell C hardness have been broached by the use of tungsten-carbide balls. In most applications, the balls used are high-carbon chromium steel of 63 to 66 Rockwell C hardness, and they are held to a maximum spherical tolerance of 0.00001 inch. One or two thousand parts can be broached with these balls before it becomes necessary to replace them. Balls of 0.0625 inch diameter, plus or minus 0.0002 inch, are considered standard because they provide the greatest number of grooves for the smallest size that can be held in a race.

The depth of furrows is limited to the point at which the balls stop rolling. A maximum groove depth of 0.0015 inch is obtainable in the materials used for this purpose. Under- and over-sized balls within 0.0005 inch may be matched and used to eliminate unnecessarily close tolerances on the ball race in the broach.

Ball-broaching is applied to either internal or external surfaces, only the harder of two mating parts being broached. An example of external ball-broaching may be seen in Fig. 7. Here a liner, which has been carburized on the inside diameter, is held in a fixture on an arbor press. This part is made of Aeronautical Materials Specification 6260 steel and has an outer diameter hardness of 40 Rockwell C. After the outside diameter has been broached, the liner is pressed into the bore of a hydraulic coupling casing for the "Wasp Major" engine (Fig. 9).

A good lubricant is essential to ball-broaching because the combination of pressure and the relatively hard balls acting on the work tend to produce a shearing action.



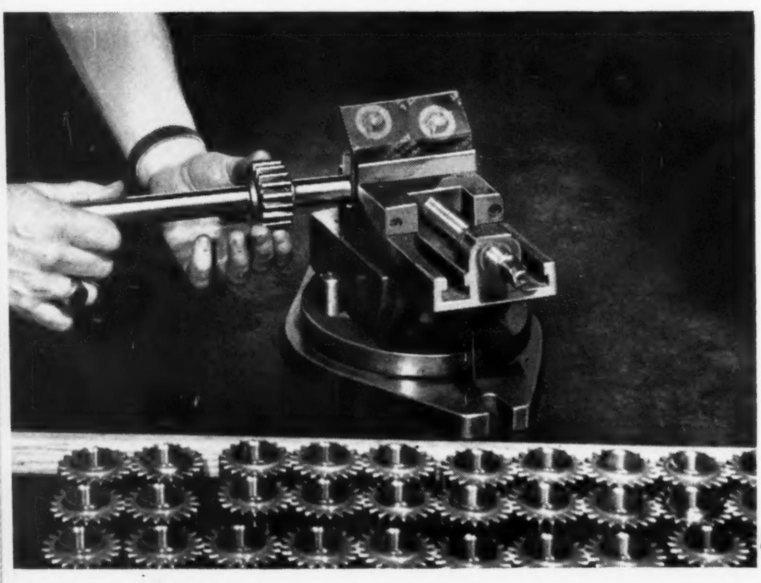


Fig. 7. (Center) External ball-broaching of a liner that has a carburized bore for assembly in a hydraulic coupling casing

Fig. 8. (Left) The bores of bushings assembled in ball-broached gears are checked with a tapered plug gage

Fine spindle oil mixed with white lead is used for lubrication in many of these operations.

The ball-broaching operation performed on the reduction gears illustrated in Fig. 4 may be seen in Fig. 10. These gears are used in the nose assembly on the propeller shaft of the "Wasp Major" engine shown in the heading illustration. AMS 6260 steel forgings are used for the gears, which are carburized and hardened at the teeth to 83 Rockwell A for a depth of 0.025 to 0.040 inch. The bore hardness does not exceed 40 Rockwell C.

Before broaching, the maximum permissible taper on the bore diameter is 0.0003 inch and the bore diameter tolerance is 0.0005 inch. A chamfer is provided at the edge of the bore to facilitate entry of the broach and of the bushing. The bushing is pressed into assembly with the gear in the same direction in which the broach entered. No burring or other operations are performed on the gear bores after broaching, although a visual inspection is made to be certain that good surface finishes are maintained. The average production is 100 to 125 gears per hour.

The bores of assembled gears and bushings are inspected with plug gages (Fig. 8) which have small tapers, amounting to 0.0005 inch in 1 foot. These gages also serve to determine whether or not deformation of the bore of the bushing has occurred during assembly with the gear. This condition may be readily noticed after the assembly is moved to the large end of the tapered arbor by shiny sections appearing at the deformed areas. Although such deformation is uncommon, when it does occur, the bushing is pressed out and another substituted.

In this connection, one of the particular advantages of the ball-broaching method of anchoring bushings is that a replacement part is held just as tightly as the original. After bushings have been replaced as many as five times, marks on the outside diameters have shown that anchorage by metal displacement still exists.

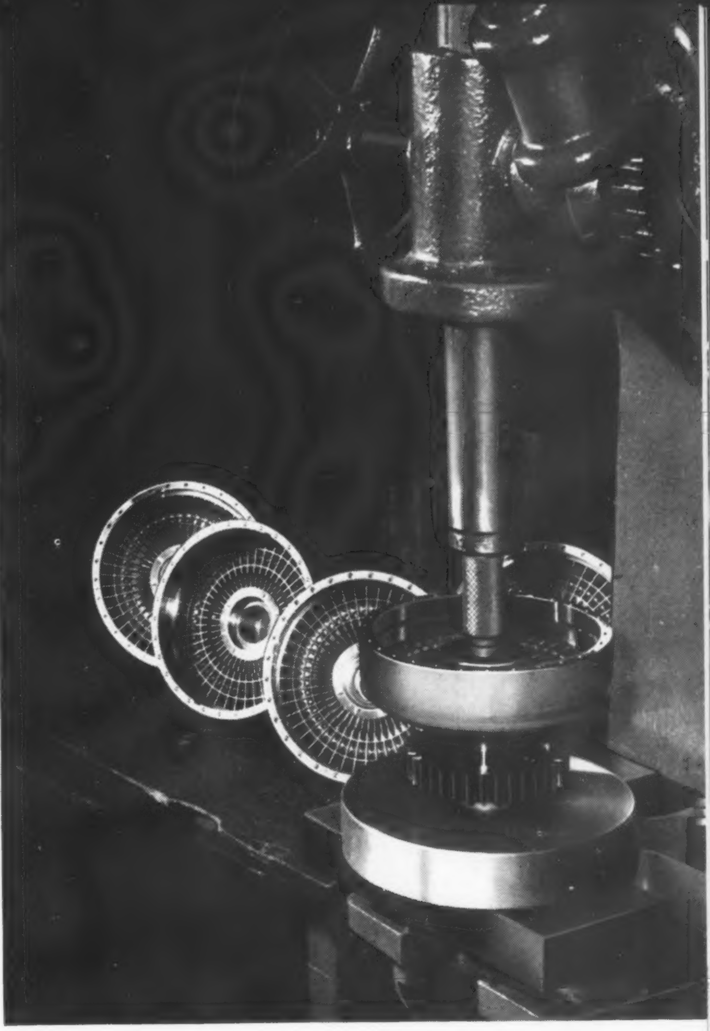


Fig. 9. (Top) Pressing an externally broached liner into the casing of a hydraulic coupling for the "Wasp Major" engine

Fig. 10. (Right) The reduction gears shown in Fig. 4 are ball-broached at the rate of 100 to 125 per hour

How to Estimate Costs of Shaper Jobs

Second in a Series of Articles on Estimating Machining Costs in the Job Shop, Covering All the Basic Types of Machine Tools

By HERBERT W. BROWN
Management Consultant

IN job shop estimating, it is highly important to analyze the machining specifications of the work relative to the available equipment. No gain is made in establishing speeds, feeds, or depths of cut for estimate purposes if a machine tool is not capable of performing in accordance with the planning. During the planning procedure, attention should be given to surfaces that have irregular areas, lugs, and so forth. Determine the time required to machine regular surfaces separately, compared with that needed to shape irregular contours. It may be more efficient to machine lugs, bosses, and other projections separately, where strokes shorter than those used for the regular areas can be employed, thereby reducing machining time.

The speeds recommended for shaper work are similar to those used for planers, and are computed in somewhat the same manner. As most shapers are designed for rapid ram return, the forward or cutting stroke determines the net or actual cutting speed. In order to establish a speed differential between forward and return strokes, it is good practice to time-check shapers at their slowest speed, noting the difference between the speeds of forward and return strokes. The ratio thus obtained will serve as a factor for determining the actual cutting speed, or the number of feet per minute the tool travels while cutting.

For example, when 60 per cent of a given amount of time is applied to forward strokes and 40 per cent to return strokes, a 60 to 40 ratio exists between these speeds. If the length of stroke is set at 2 feet and the rate of ram travel is six complete strokes per minute, then six forward strokes, each 2 feet in length, are made in 0.6 minute, and six return strokes, each 2 feet in length, are made in 0.4 minute. At the rate of 12 feet in 36 seconds, or 1 foot in 3 seconds, the actual cutting speed is 20 feet per minute. The rate of return at 12 feet in 24 seconds, gives a return speed of 30 feet per minute.

In preparing a table for quickly determining the actual cutting speeds obtained at any given range of strokes per minute, the range of ram speeds on the shaper should be checked. Speeds may vary from as low as 6 to as high as 130 or more strokes per minute. For purposes of calculation and for developing such a table, the following formula can be used: Multiply the length of stroke L in inches by the number of strokes per minute S, and divide this product by a time factor R multiplied by 12. (The time factor is equal to the fraction of 1 minute spent in total forward movement.)

Example—Let L = length of stroke = 24 inches; S = number of strokes per minute = 6; and R = time factor = 0.6 minute. Then the actual cutting speed is:

$$\frac{LS}{R \times 12} = \frac{24 \times 6}{0.6 \times 12} = 20 \text{ feet per minute}$$

The ram return speed is not taken into consideration in estimating cutting speeds because all cutting of material is done by the forward stroke. The number of forward strokes per minute and the length of stroke determine the cutting speed. Table 1 shows the range of cutting speeds in feet per minute for a 24-inch shaper having a 60 to 40 ratio between forward and return speeds. The two columns at the right give the recommended high and low cutting speeds for given lengths of stroke. These speeds will be found to be practical for most classes of shaper work.

It will be observed that the speeds given in this table are not, as a whole, ideal for average machining conditions because the number of strokes per minute on this machine do not overlap sufficiently. For example, there is no intermediate cutting speed between 42.5 and 60 feet per minute at a 24-inch stroke length due to the construction of this particular machine. Modern shaper designs have improved this condition considerably, and when recommended cutting speeds are used in conjunction with such equipment, better machining results are obtained.

In setting up cutting speed tables, it is advisable to establish a range of speeds, so any unusual job may be estimated without special calculations. When machining some materials, such as brass or bronze, for example, it is desirable to use a higher cutting speed than that recommended for other materials, provided, of course, the shaper construction will permit the more rapid ram travel. This should not be done when operating the shaper on stroke lengths approaching its capacity, as the inertia built up by the ram movement may damage the shaper.

Table 1. Actual Cutting Speeds, in Feet per Minute, for Various Lengths of Stroke and Ram Speeds

Length of Stroke, Inches	Number of Strokes per Minute (Back-Gears In)								Recommended Cutting Speeds	
	6	10	13	18	34	48	68	95	High	Low
24	20	33.4	42.5	60.0	115.0	....	....	....	60.0	42.5
23	19.2	32.0	41.7	57.8	108.0	....	....	....	57.8	41.7
22	18.4	30.6	40.0	55.0	106.0	....	....	....	55.0	40.0
21	17.5	29.2	37.9	52.5	99.0	....	....	....	52.5	37.9
20	16.7	27.7	36.0	50.0	95.0	....	....	....	50.0	36.0
19	15.8	26.4	34.4	47.5	90.0	....	....	....	47.5	34.4
18	15.0	25.0	32.6	45.0	85.5	....	....	....	45.0	32.6
17	14.2	23.7	31.8	42.5	80.5	....	....	....	42.5	31.8
16	13.3	22.2	29.0	40.0	75.5	....	....	....	75.5	40.0
15	....	21.8	27.3	37.5	72.0	100.0	....	....	72.0	37.5
14	....	19.5	25.3	35.0	66.0	93.5	....	....	66.0	35.0
13	....	18.0	23.5	32.5	62.5	87.0	....	....	62.5	32.5
12	....	16.7	21.7	30.0	56.8	80.5	111.8	....	56.8	30.0
11	....	15.3	20.0	27.6	52.0	73.5	102.0	....	73.5	52.0
10	....	13.8	18.2	24.0	47.4	66.8	94.5	....	66.8	47.4
9	....	....	....	22.4	42.5	60.0	85.0	....	60.0	42.5
8	....	....	....	20.0	37.8	53.2	75.5	....	53.2	37.8
7	....	....	....	17.5	33.0	46.6	66.0	92.0	66.0	46.6
6	....	....	....	....	28.3	40.0	56.8	78.0	56.8	40.0
5	....	....	....	....	23.6	33.4	47.5	66.0	66.0	47.5
4	....	....	....	....	18.8	26.8	38.0	52.5	52.5	38.0
3	....	....	....	....	....	20.0	28.3	39.5	....	39.5
2	....	....	....	....	....	13.3	18.9	26.5	....	26.5
1	....	....	....	....	....	....	....	13.2	....	13.2

Note: Speeds given are for a typical 24-inch belt-drive shaper with a 60 to 40 ratio between forward and return speeds. Figures inside heavy lines indicate cutting stroke rates that are within range of recommended speeds for given stroke lengths.

Table 2. Shaper Time, in Minutes, Required to Machine Plain Surfaces — Based on a Traverse Feed of 0.005 Inch Per Stroke

Width of Work, Inches	Number of Strokes per Minute							
	95	68	48	34	18	13	10	6
	Length of Stroke, Inches (High Speed)							
	1 to 5	6 to 7	8 to 10	11 to 14	15 to 24			
1/4	0.7	1.0	1.3	1.9	3.5			
1/2	1.3	1.9	2.6	3.7	7.0			
1	2.6	3.7	5.2	7.4	14.0			
2	5.2	7.4	10.4	14.8	28.0			
3	7.8	11.1	15.6	22.2	42.0			
4	10.4	14.8	20.8	29.6	56.0			
5	13.0	18.5	26.0	37.0	70.0			
6	15.6	22.2	31.2	44.4	84.0			
7	18.2	25.9	36.4	52.8	98.0			
8	20.8	29.6	41.6	59.2	112.0			
9	23.4	33.3	46.8	66.6	126.0			
10	26.0	37.0	52.0	74.0	140.0			
20	52.0	74.0	104.0	148.0	280.0			
Width of Work, Inches	Length of Stroke, Inches (Low Speed)							
	1 to 3	4 to 5	6 to 7	8 to 10	11 to 15	16 to 24		
1/4	0.7	1.0	1.3	1.9	3.5	4.9		
1/2	1.3	1.9	2.6	3.7	7.0	9.6		
1	2.6	3.7	5.2	7.4	14.0	19.2		
2	5.2	7.4	10.4	14.8	28.0	38.4		
3	7.8	11.1	15.6	22.2	42.0	57.6		
4	10.4	14.8	20.8	29.6	56.0	77.8		
5	13.0	18.5	26.0	37.0	70.0	96.0		
6	15.6	22.2	31.2	44.4	84.0	116.0		
7	18.2	25.9	36.4	52.8	98.0	134.0		
8	20.8	29.6	41.6	59.2	112.0	154.0		
9	23.4	33.3	46.8	66.6	126.0	173.0		

Note: In the figures given, the following allowances have been included: Delays, 10 per cent; tool grinding, 5 per cent; measuring, 5 per cent; and other essential interruptions, 5 per cent, making a total of 25 per cent.

The next step in the estimating procedure for shaper work is to develop a time chart. This shows the amount of time required to machine plain surfaces of various widths and lengths, using the minimum traverse feed available on any particular machine. The speeds used for establishing the basic time chart, Table 2, are the recommended speeds given in the right-hand columns of Table 1. Because the shaper ram speeds used to obtain the recommended cutting speeds are employed in calculating the time required for a given job, Table 2 can be used directly for estimating purposes.

In setting up the time chart, a basic traverse feed of 0.005 inch per stroke was used. If a particular shaper does not have this feed, use the lowest feed the machine provides. This will result in the longest possible time to machine a surface at a given number of strokes per minute, thus providing a basic figure from which the machining time at any other selected feed divisible by the basic feed used can be calculated by applying a factor based on the ratio between the selected feed and the minimum feed.

In developing the time chart, first determine the number of strokes required to machine work of a given width. This is done by dividing the width of the surface to be machined by the minimum feed per stroke. The next step is to multiply the number of strokes required by an allowance factor for delays, tool grinding, measuring, and other necessary interruptions, and then divide this product by the number of shaper strokes per minute.

Example—If the surface to be machined is 0.250 inch wide and the minimum feed is 0.005 inch per stroke, 50 strokes will be required. Assuming that the shaper is operated at 34 strokes per minute and 50 strokes are needed to machine the 0.250-inch width, if 25 per cent is added for delays (making an allowance factor of 1.25), the time required will be 1.84 minutes.

Let F = basic feed per stroke; W = surface width; S = number of strokes per minute; and A = an allowance factor of 1.25. Then:

$$\frac{W}{F} = \frac{0.250}{0.005} = 50 \text{ strokes}$$

$$\frac{50A}{S} = \frac{50 \times 1.25}{34} = 1.84 \text{ minutes}$$

To make allowance for using other feeds than that on which the time chart is based in order to suit machining conditions, the charted time given in Table 2 is multiplied by a conversion factor. This conversion factor is obtained by dividing the minimum feed per stroke (used in setting up the time chart, Table 2) by the desired feed for any given job.

Example—If the basic minimum feed F equals 0.005 inch per stroke, and the desired, or selected, feed F_s is 0.060 inch per stroke, then

$$\frac{F}{F_s} = \frac{0.005}{0.060} = 0.0833 \text{ conversion factor}$$

The use of conversion factors is to reduce the estimating procedure to a minimum, since the purpose of these articles is to provide estimating short-cuts while retaining the accuracy afforded by using feeds and speeds recommended by the

machine tool industry. If it were necessary for the estimator to calculate speeds and feeds to suit various machining conditions, different set-ups, and varying hardnesses and machinability of metals, the time required to accomplish a complete estimate would be so long that it would not be profitable to operate such a system.

Example of Procedure in Estimating the Machining Time for a Simple Shaper Job

The method of estimating the machining time for a simple shaper job will be clear from the following example: Determine the time required for rough- and finish-machining a piece of hot-rolled steel 6 inches wide by 15 inches long by 2 inches thick; and also for roughing and finishing a step 1/2 inch deep by 3 inches wide by 15 inches long. A feed of 0.060 inch per stroke is selected for roughing, and a feed of 0.30 inch per stroke for finishing. The time charted in Table 2 is as follows:

Operation	Minutes
Roughing 6- by 15-inch surface, one side	84.0
Roughing 6- by 15-inch surface, opposite side	84.0
Roughing 2- by 15-inch surface, one edge	28.0
Roughing 2- by 15-inch surface, opposite edge	28.0
Roughing 2- by 6-inch surface, one edge	7.4
Roughing 2- by 6-inch surface, opposite edge	7.4
Total charted time for roughing	238.8

The total charted time (238.8 minutes) multiplied by the conversion factor ($0.005 \div 0.060 = 0.0833$) amounts to 19.9 minutes for taking one roughing cut on all surfaces of this piece. The same procedure is repeated for determining the finishing time. Again, the basic time will be 238.8 minutes; however, since the conversion factor for the finishing feed of 0.030 inch per stroke is $0.005 \div 0.030 = 0.166$, one cut on all surfaces will require 39.7 minutes.

To finish the piece according to specifications, the step remains to be machined. If a depth of cut of 0.125 inch is selected, four cuts 3 inches wide by 15 inches long will be required (less finishing stock allowance). The charted time in Table 2 for this area is 42 minutes per cut, or a total of 168 minutes for four cuts. When multiplied by the conversion factor 0.0833 for rough-machining, the estimated time amounts to 13.9 minutes.

The finishing of the step will generally require two light cuts, since the depth as well as the width must be maintained. Again, the charted time in Table 2 is 42 minutes per cut for a 3-inch surface 15 inches long. Two cuts at 42 minutes apiece multiplied by the conversion factor for finish-machining (0.166) results in an estimated time allowance of 13.9 minutes. It is good practice in estimating time for finish-shaping vertical surfaces, such as those formed by the sides of the step in this example, to add approximately 50 per cent to the computed time. In this case, 13.9 minutes for two cuts plus 50 per cent, or 6.9 minutes, gives a total of 20.8 minutes for finishing the step.

A summary of the estimated time, in hours, for the complete job is as follows:

Set-up time allowance (Estimated)	0.30 Hour
Rough-machining piece (19.9 Min.)	0.33 Hour
Finish-machining piece (39.7 Min.)	0.66 Hour
Rough-machining step (13.9 Min.)	0.23 Hour
Finish-machining step (20.8 Min.)	0.35 Hour
Total estimated time	1.87 Hours

In shops where there are several planers or shapers made by different manufacturers and having various basic feeds, it is well to set up a conversion chart for each machine, showing recommended feeds for different materials and set-ups, as well as the conversion factors required to calculate time tables based on minimum feeds. Table 3 represents such a chart. From these charts, a single table can be made to cover a group of machines. This will be based on average feeds and conversion factors, since small differences in feed rates (such as 0.001 inch per stroke) will not appreciably affect calculated time estimates.

When discrepancies occur between estimated and actual machining time, it is highly desirable to know the cause of such variations. Estimating errors are often repeated when detailed information as to machining data is not made available. By recording all pertinent machining data and correlating it with the time-keeping records, a constant check on the accuracy of the estimates is obtained, as well as a record of production time. Such information is particularly desirable when competition makes it necessary to reduce costs. Not only may shop progress be measured more accurately by this means, but also management is kept informed of results during the course of daily operations.

When a cost-estimating system such as outlined in these articles is being established, the policy should be followed of investigating complaints made by shop supervision as to disagreements concerning the estimates. It is important that cooperation between the shop and manage-

Table 3. Shaper Conversion Table

Based on Roughing and Finishing Speeds Shown in Table 2

Material	Set-Up Condition	Speed	Recommended Feed per Stroke, Inch	Time Estimating Conversion Factors*
Cast Iron				
Hard	All Set-ups	Low	0.025–0.040	0.200–0.125
Medium Soft	Rigid Set-up	High	0.040–0.070	0.125–0.071
Medium Soft	Strong Set-up	High	0.030–0.050	0.167–0.100
Medium Soft	Weak Set-up	High	0.025–0.040	0.200–0.125
Soft	Rigid Set-up	High	0.060–0.100	0.083–0.050
Soft	Strong Set-up	High	0.040–0.070	0.125–0.071
Soft	Weak Set-up	High	0.030–0.050	0.167–0.100
Finishing	All Set-ups	Low	0.030–0.125	0.167–0.040
Steel				
Hot-Rolled Machinery	Rigid Set-up	High	0.040–0.070	0.125–0.071
Hot-Rolled Machinery	Strong Set-up	High	0.030–0.060	0.167–0.083
Cold-Rolled Low-Carbon	Rigid Set-up	High	0.040–0.060	0.125–0.083
Cold-Rolled Low-Carbon	Strong Set-up	High	0.030–0.050	0.167–0.100
Castings, Carbon	Strong Set-up	Low	0.030–0.060	0.167–0.083
Castings, Carbon	Weak Set-up	Low	0.030–0.050	0.167–0.100
Castings, Alloy Free Machining	Strong Set-up	Low	0.040–0.060	0.125–0.083
Castings, Alloy Free Machining	Weak Set-up	Low	0.030–0.050	0.167–0.100
Castings, Alloy Tough Machining	All Set-ups	Low	0.025–0.040	0.200–0.125
Finishing	All Set-ups	Low	0.025–0.060	0.200–0.083
Brass and Medium Bronze	Rigid Set-up	High	0.060–0.100	0.083–0.050
Brass and Medium Bronze	Strong Set-up	High	0.040–0.070	0.125–0.071
Brass and Medium Bronze	Weak Set-up	High	0.030–0.050	0.167–0.100
Bronze-Manganese	Rigid Set-up	High	0.030–0.060	0.167–0.083
Bronze-Manganese	Strong Set-up	High	0.030–0.050	0.167–0.100
Bronze-Manganese	Weak Set-up	High	0.030–0.040	0.167–0.125

*Multiply time given in Table 2 by these conversion factors to determine actual time required for a given job at recommended feeds. Note: Vertical feeds are approximately one-half minimum recommended feeds.

ment be maintained at a high level. Controversial questions as to machine capacity should be settled by tests to the satisfaction of all concerned, and the results incorporated in the estimates.

Piece handling time—that is, the time for handling a piece of work from floor to floor (which is time measured on quantity production)—is considered part of the set-up time, and is not a separate phase of estimating job shop work. If it becomes desirable to apply the estimating plan as set forth in these articles on a larger quantity production basis, the estimator can establish quantity factors and apply them in a similar manner to the feed-rate conversion factors. It should be emphasized that the estimating system here described was designed for use on one- or two-piece production only, and is not applicable without suitable modification to quantity production.

Subsequent articles will describe the estimating of milling machine work in the job shop, including horizontal, vertical, and boring mill operations.

How to Handle War Surplus Machine Tools

A SIX-POINT program for allocating Government-owned surplus machine tools to the benefit of the machine tool industry, the United States Government, Western European nations, and the taxpayer has been outlined in a pamphlet by Charles A. Simmons, president of the Simmons Machine Tool Corporation, Albany, N. Y.

The six points outlined are: (1) Discontinue waste of funds on repairing and processing surplus machinery; (2) allocate surplus machinery to government contractors, European nations, and small manufacturers who cannot afford to buy new equipment; (3) make a simple inventory of surplus equipment; (4) centralize the inventory so that it is controlled from one department; (5) have surplus equipment rebuilt before shipment to ultimate user; and (6) have the Economic Cooperation Administration allocate surplus machinery to the countries of Western Europe and charge these machines against E.C.A. funds on a basis of 80 per cent of present-day prices for the equipment.

Industry's Most Urgent Problem

WITH the return of prewar competition in national and international markets, and the insistence of the general public that the prices of commodities must come down, the most important problem confronting manufacturers today is how to effect substantial reductions in manufacturing costs. Evidence that manufacturers in the metal-working industries are keenly aware of this problem is indicated by the mounting requests in engineering departments of machine tool building concerns for lay-outs of improved production methods.

Only minor savings can be effected in material costs, and there is not much chance of reducing wages, so that the shortest path to lower production costs is through higher hourly output per man. No less a person than William Green, president of the American Federation of Labor, has recognized the desirability of greater productivity at this time, and has urged all members of his union to produce more goods per hour.

It is evident that substantial reductions in manufacturing costs are obtainable mainly through the use of the latest types of metal-working machinery and tools. Manufacturers in the metal-working industry should, therefore, inform themselves about the great advances that have been made in machine tool design since the Chicago Show of just two years ago.

Several developments almost phenomenal in character were introduced to production men at the Vermont machine tool exhibits held several weeks ago. Automobile-drive pinion-shafts were machined from rough forgings in an actual cutting time of only 8 1/2 seconds to an unusually high degree of finish, the floor-to-floor time being 17 seconds. In another operation, a 3/4-inch thread of ten threads per inch and 1 1/2 inches in length was cut on a bolt, also to a high degree of finish, in only 1/3 of a second! A standard die-head equipped with carbide chasers made this remarkable record.

The spindle speed in taking turning and facing cuts on small bolts in a six-spindle automatic was 3820 R.P.M., and in threading the bolts, the spindle speed was 4500 R.P.M. The production on these bolts, 3/8 inch in diameter by 1 7/8 inches long under the head, was 2000 pieces per hour. Wheel-spindles operating at 90,000 R.P.M. were a feature of internal grinding machines.

Manufacturers cannot afford to neglect the cost reducing possibilities that such modern equipment provides compared with the war-worn and obsolete machinery being used in many industrial plants. One of the hindrances to the modernization of industrial plants, however, is the retention by the United States Treasury Department of present income tax depreciation rates on new machine tools. The period for the write-off of machine tools is from fifteen to twenty-five years.

Under this regulation, industrial concerns are still compelled to depreciate machines that have long ago become obsolete. The United States is almost the only one among the major nations of the world that follows such a progress-retarding policy. Switzerland, for example, has for years permitted a write-off of up to 80 per cent of the cost of machine tools in the first year, and hence, has some of the most modern plants in the world.

With business slowing up and the need for cost reduction imperative, a concerted effort should be made to get the Government to revise depreciation regulations on manufacturing equipment. How effective such an effort would be if industrial leaders could enlist the aid of Mr. Green and other production-minded labor leaders!

Charles O. Herb

EDITOR

Taper-Milling of Aircraft Wing Skins

By A.C. SLATTER and J. J. SLOAN
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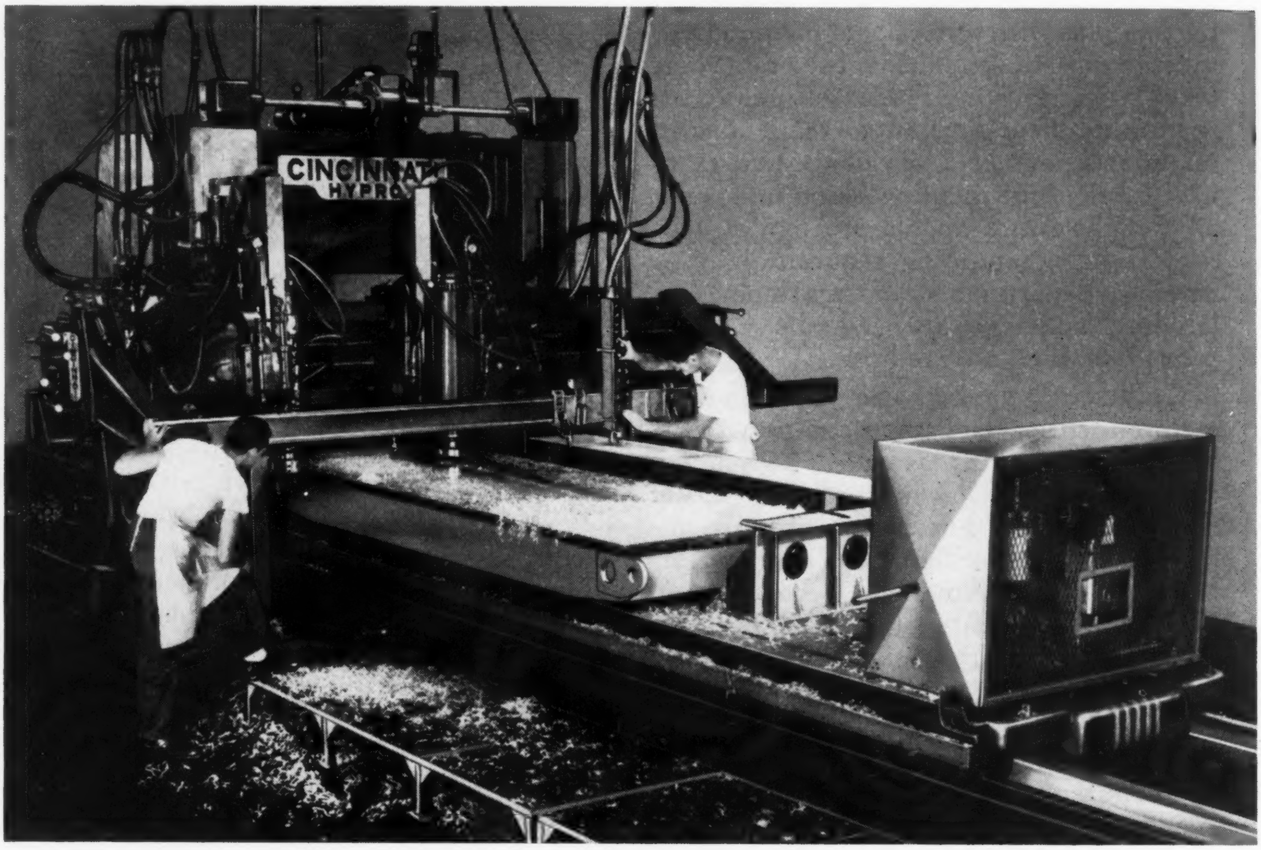


Tapered Metal Sheets are a Recent Innovation, at One Time Thought to be Impractical Because of the High Cost of Producing Them. North American Aviation Engineers have Developed Methods of Economically Machining Tapered Aluminum Alloy Wing and Fuselage Skins in a Variety of Shapes as Described Here

IN the constant competition to increase aircraft performance, reduction of weight is of primary importance. Among the latest techniques in airframe construction is the use of tapered metal sheets, which save weight by distributing the mass of metal where it is required to carry the load. Tapered wing skins were developed by North American Aviation engineers for the F-86 sweptback-wing fighter plane to provide maximum strength with minimum weight.

Because conventional wing skins that are thick enough to carry the maximum load at the aircraft fuselage are much heavier and stronger than necessary at the wing tip, a method of removing material in these areas is of obvious advantage. Even a slight taper in the wing skin will appreciably reduce weight. For example, any thickness of aluminum alloy sheet measuring 48 by 144 inches and tapering by only 0.005 inch in its total length, will be 1.7 pounds lighter than a corresponding sheet of uniform thickness. When the taper is increased to 0.050 inch, the reduction in weight is 17 pounds.

Tapered metal sheets are a recent innovation, at one time thought to be impractical because of the high cost of producing them. Now, however, aluminum alloy wing and fuselage skins, spar

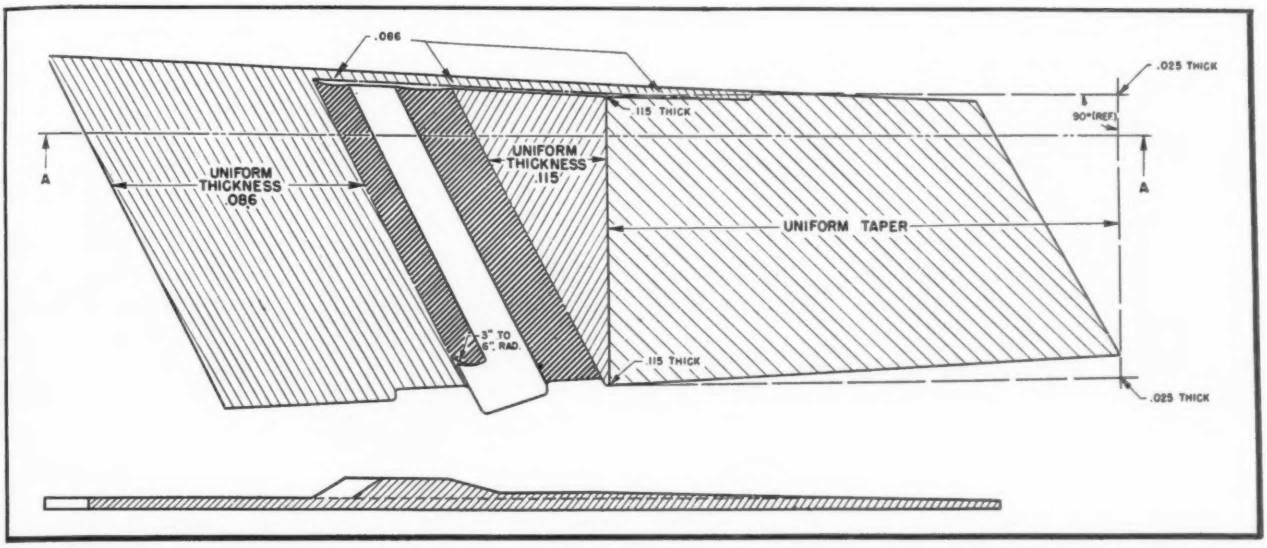


Fig. 1. A typical aircraft wing skin, contour-milled from aluminum-alloy plate stock. Greater thicknesses are required in certain areas to provide for the use of rivet and bolt fasteners

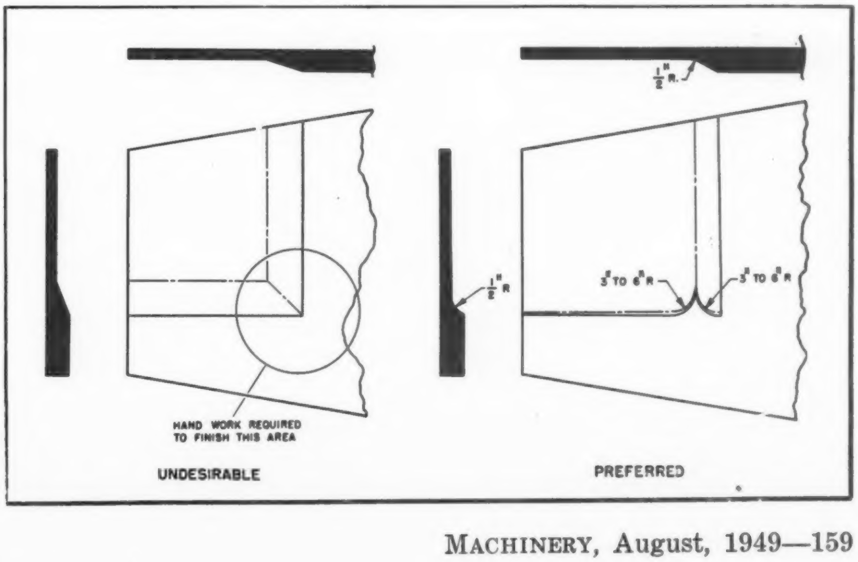
webs, and other structural members having a uniformly tapered thickness from end to end have been produced experimentally by rolling. When other than a uniform taper is required, as is the case with the F-86 wing skins, "islands," thick edges, or steps can be economically produced on the sheets by machining, as described in the following.

A typical wing skin contour-milled from plate stock is shown in Fig. 1. While a uniformly tapered wing skin would be satisfactory to carry the necessary load, greater thicknesses must be provided in certain areas where rivet or bolt fasteners are to be applied for transmitting the load. Such parts are produced on Cincinnati planer type milling machines of the type shown in the heading illustration. The work-piece is clamped along its edges to a hold-down plate mounted on the table of the machine. Air is evacuated beneath the sheet to be machined, thus creating a vacuum that securely holds the sheet during machining.

Milling is accomplished by traversing the table and the sheet below the revolving milling cutters or by keeping the table stationary and feeding the milling head transversely across the work-piece. Angular cuts can be made by properly adjusting the table speed relative to the transverse feed of the milling head. Depth of cut is adjusted only when the machine is not in operation. A tracer control mechanism is provided on the machine to guide the milling cutters during contour or angular cuts.

The type of taper obtained can be varied by changing the position of the hold-down plate; the plate is arranged flat for step-milling or tipped at an angle for machining a uniform taper. Short uniform tapers, of 12 inches maximum length, can be produced in conjunction with step-milling by tilting the milling head.

Fig. 2. Blending of the corner formed by two tapered surfaces, as seen at the left, is a difficult machining operation requiring hand work for finishing. The preferred design is shown at the right, where a fillet and a tapered surface are blended together



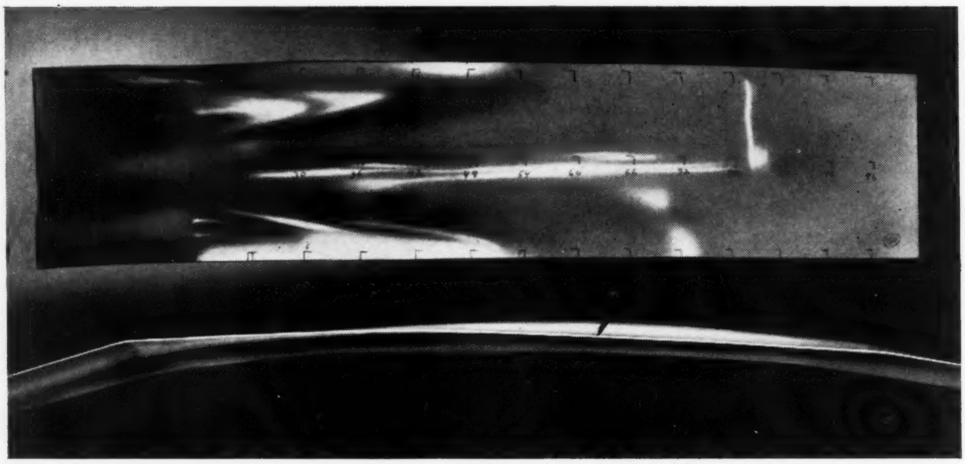


Fig. 3. Compound curves are formed in taper-milled airfoil or fuselage skins by stretching. Care must be exercised in stretch-forming to prevent splitting the thinner sections

At the present time, the minimum size sheet accommodated by the hold-down plate is 48 by 130 inches, and the maximum thickness and width of sheet that can be held flat on the machine is 0.625 inch by 48 inches. The longest sheet that will fit in the machine is 20 feet, and although 130 inches is the maximum length of cut that can be taken, the sheet can be shifted on the hold-down plate to complete the cut on longer sheets. Minimum thickness after milling is 0.020 inch. Desired thicknesses can be maintained within a tolerance of ± 0.005 inch.

A crane equipped with a vacuum lifting device is used for loading and unloading the sheets. The lifting device consists of a triangular-shaped frame provided with three vacuum cups. A small motor-driven vacuum pump, mounted on top of this frame, evacuates air from the cups, permitting the sheets to be easily lifted.

To simplify machining, tapered skins are designed, whenever possible, so that straight cuts parallel to or at 90 degrees with the direction in which the machine table is traversed can be taken. Profile and angular cuts, however, are made possible by means of the templet and stylus control mechanism. Also, with infinitely variable speed ratios available between the transverse travel of the milling cutter head and the longitudinal travel of the machine table, cuts can be made in any direction.

The most difficult operation in tapered skin milling is the blending of cuts. Certain types of internal corner cuts can be produced only with extreme care and skillful manipulation of the machine controls. Especially difficult is the blending at the intersection of two tapered surfaces, as seen at the left in Fig. 2. The preferred design is the blending of two fillets, or, as seen at the right, a fillet and a tapered surface.

A radius of 1/2 inch has been adopted as the most suitable standard for blending, and the milling cutters are accurately ground to this radius. The diameter of the circle described by the milling fly cutter should be from 6 to 12 inches to give a radius at the inside corner of the blend of 3 to 6 inches. Smaller diameter cutters would require more passes over a given area to remove the desired material. Diameters larger than 12 inches are impractical at present because of deflection of the cutter and difficulty in blending the machined surfaces.

Taper-milled sheets are cut to the desired out-

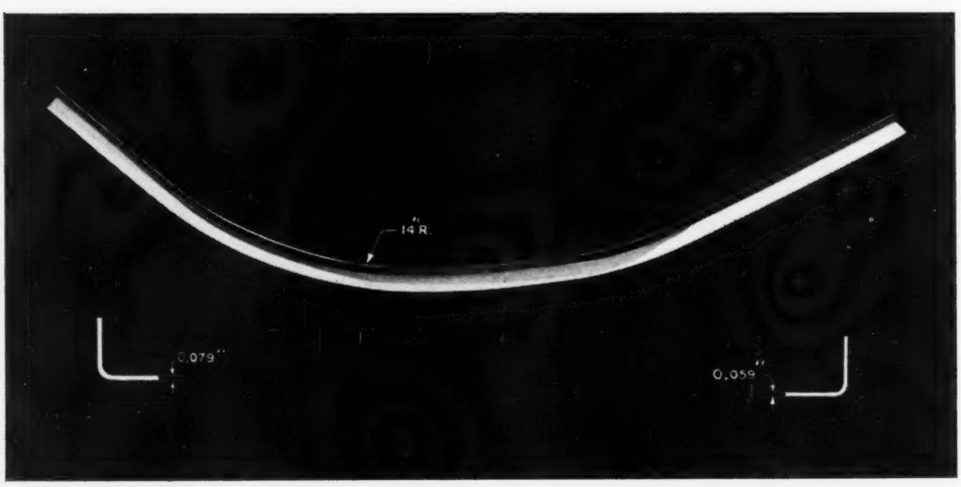


Fig. 4. Tapered sheet that has been formed into an angle on a press brake and stretched to the desired contour. The thickness varies from 0.079 inch at the left to 0.059 inch at the right

line after milling. Holes are then either drilled or pierced in the sheet, and forming in single-plane curvature is done on a rolling machine or press brake. A specially shaped punch is sometimes required to fit the contour of the tapered sheet. Compound curves such as illustrated in Fig. 3 have been formed by stretching. Tapered sheets can also be formed into angles or channels on a press brake, and subsequently stretched to the desired contour, as seen in Fig. 4.

In stretch-forming of tapered sheets, the tendency is for the thinner portion to fracture before the rest of the sheet takes a permanent set. By skillful manipulation of the stretching machine, however, and dependence upon the friction between the part and the form block, the thinner portions can be formed first. As forming progresses, the tension is increased and the friction helps to keep the part from splitting.

Warpage caused by machining 75S-T6 aluminum alloy has not been a serious problem. Since the machining is done on the inside of an airfoil or fuselage skin, the warpage is generally in this direction and aids rather than hampers subsequent forming. With clad aluminum alloy sheet, the pure aluminum protective coating is removed from one side during milling, and therefore subsequent anodizing is required.

* * *

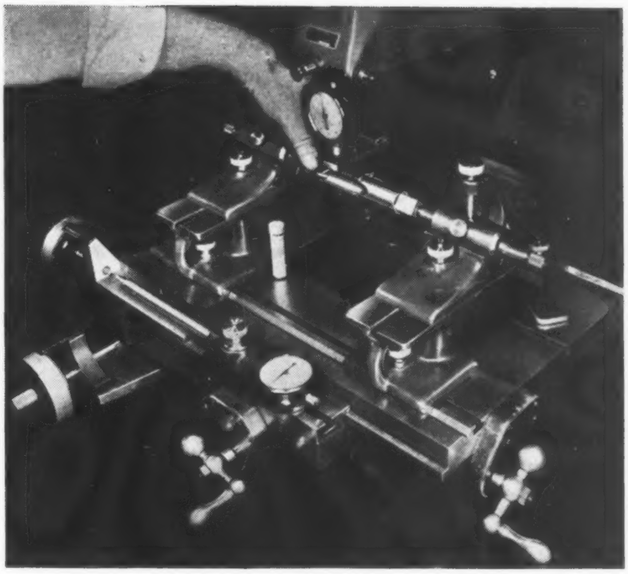
Olympia Engineering and Marine Exhibition

The seventeenth biannual Engineering and Marine Exhibition will be held at Olympia, London, from August 25 to September 10. This exhibition was first held in 1906, and has taken place regularly ever since in alternate years, except during the war periods.

The exhibits will cover an extremely wide range of engineering products, including machine tools, internal combustion engines and other marine equipment, welding machines, precision measuring instruments, industrial X-ray apparatus, safety devices, metal-spraying equipment, and newly developed materials and alloys. The largest stainless steel tube ever to be produced by the solid drawn process will be displayed, and at the other end of the scale, the smallest twist drill in the world produced in quantities for everyday use in fine instrument work will be shown.

* * *

Raw materials for making motor vehicles come from all forty-eight states and about fifty-five foreign countries.



Arrangement for checking three-fluted taps

Checking Three-Fluted Taps

The use of measuring wires and a micrometer or other linear measuring device is a good way of checking taps having an even number of flutes, but this method cannot be applied to odd numbers of flutes, as no two flutes are directly opposed. At the Warner & Swasey Co.'s plant in Cleveland, a large variety of three-fluted taps in a wide range of sizes and pitches are used, making it impossible to have special micrometers for each size.

The checking problem is handled by placing the taps on centers, so that the straightforward measuring wire system can be applied, as shown in the illustration. A suspended flat plate rests on wires placed in the tap flutes, and an indicator gage gives a precise reading of the plate location. The indicator gage is set the correct distance from the center line of the tap by the use of a master thread gage or by placing an arbor between centers and building up with gage-blocks. After the gage has been set, the flutes can be checked in sequence to determine if all the cutting edges are alike by rotating the tap and observing the reading of the gage.

* * *

American business, exclusive of agriculture, plans to spend $4,600,000,000 on new plant and equipment in the third quarter of this year, according to the quarterly survey of actual and prospective capital outlays conducted jointly by the U. S. Department of Commerce and the Securities and Exchange Commission. This anticipated expenditure represents a decline of about 4 per cent from the preceding quarter.

Engineering News

Precision Balancing of Large Air-Moving Assemblies

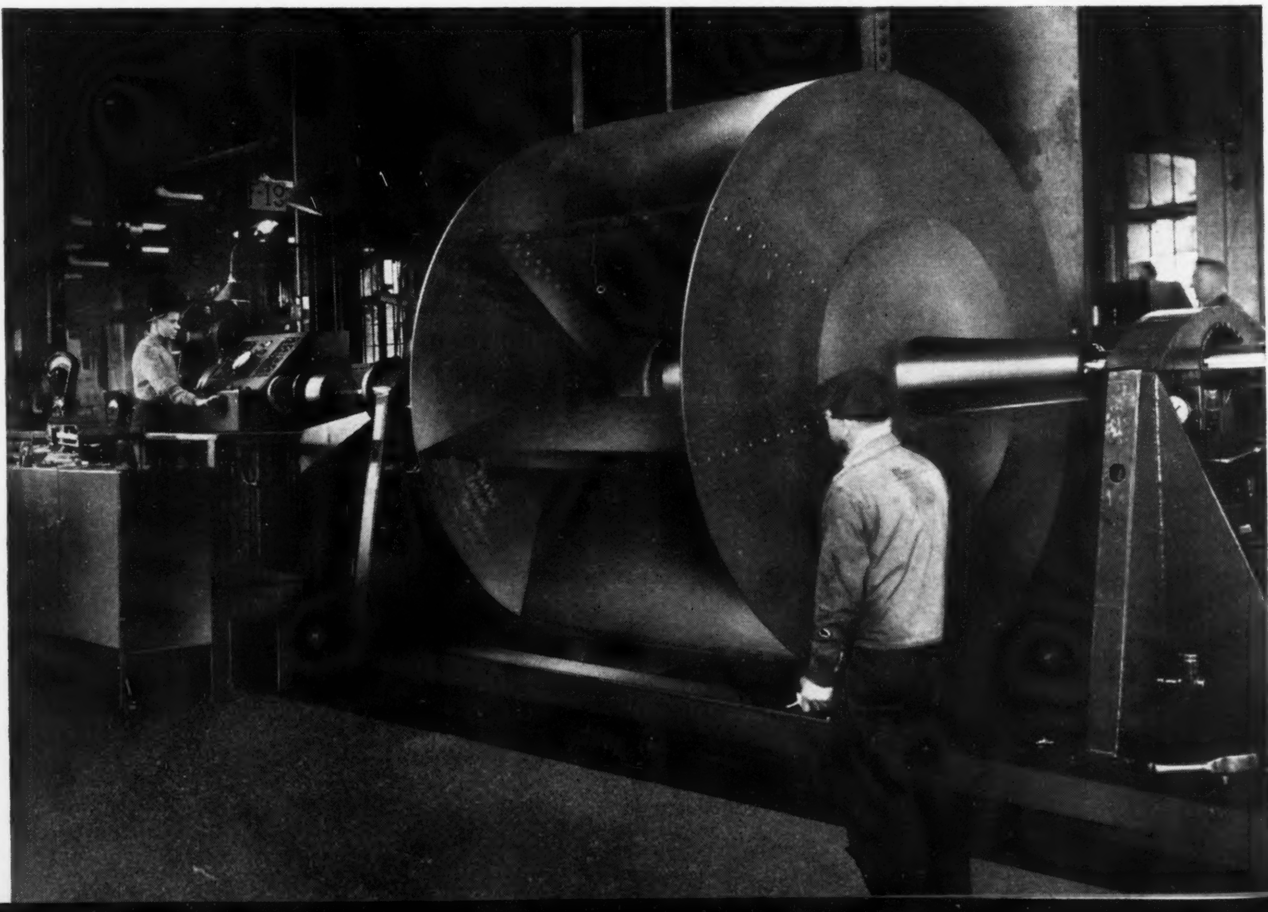
Unbalance—the cause of vibration in rotating devices, such as the 8 1/2-foot diameter 13,500-pound fan wheel and shaft illustrated—can be located in one-third the time required for mechanical balancing by the use of the Dynetric balancing machine developed by the Westinghouse Electric Corporation, Pittsburgh, Pa., and the Gisholt Machine Co., Madison, Wis. The balancing operation shown in the illustration is being performed at the Westinghouse Hyde Park, Mass., Works. With this equipment, it is possible to dynamically balance large air-moving assemblies weighing from 1500 to 2500 pounds within an accuracy of 0.000025 inch of linear movement of the floating bearings.

In performing the operation, the fan wheel and shaft are placed in the floating bearings of the machine, and prebalanced disks are tack-welded over the fan-wheel inlet to decrease the amount of power required to rotate the fan wheel. The fan-wheel shaft is connected to the shafts of a motor and sine-wave generator. After the work has been set up, the assembly is rotated at a suitable balancing speed, the unbalance being indicated by two instruments on the control panel seen at the left, one of which shows the wheel in balance, while the other indicates the angular position of the weight. The balancing weight is then welded or riveted to the wheel side plate, after which the operations are repeated for the opposite side of the fan wheel. A final check for unbalance is again made before the wheel is passed by the inspection department.

Huge Turbo-Prop Engine Rated at 10,000 Horsepower

A huge 10,000-H.P. turbo-prop aircraft engine is undergoing Navy tests at the plant of Northrop Aircraft, Inc. In this engine, a large number of compressor stages are coupled with a multiple-stage gas turbine. As existing air-frames cannot accommodate this powerful engine, static tests are being conducted at present.

Balancing a 13,500-pound fan wheel and shaft to a high degree of precision on a Dynetric balancing machine at the Westinghouse Hyde Park, Mass., Works



Largest Man-Made Lightning Center in the World

The most powerful lightning bolts ever created by man can be produced at the new high-voltage engineering laboratory of the General Electric Co., in Pittsfield, Mass. Here, at the recent opening of the laboratory, artificial lightning with a peak of 15,000,000 volts was generated. The discharge occurred across a 50-foot gap between two generators.

The high-voltage engineering laboratory is to be used to conduct basic research into the effects of lightning and other high-voltage electric discharges on power transmission lines and to study means of providing protection against lightning. A small power sub-station capable of supplying the normal electric needs of a community of some 10,000 people is required to operate the testing equipment.

The metal walls and ceiling of the building are connected to rods in the foundation of the building. A second grounding system is located under a concrete slab 6 feet from any other grounded metal. All testing equipment is connected to this ground. A controlled-temperature room, constructed of especially insulated aluminum walls, will be used to conduct high-voltage tests under temperatures from 0 to 100 degrees F., with varying degrees of humidity.

A strand of copper wire disappears in a streak of flame as 5,000,000 volts of electric power surge along it. The wire is vaporized by the sudden discharge of electricity

Control for Duplicating Road Conditions in Engine Testing Laboratory

Engineers of the Ethyl Corporation have devised a combination engine and dynamometer control that makes it possible to duplicate on a dynamometer stand the sequence of automobile engine speed and loading conditions occurring during any actual trip on the highway. The control equipment utilizes a plastic tape, and operates on the same principle as the player piano.

"Dancing" Spheres in Plastic Vial Dramatize Precision-Made Balls

A plastic vial in which minute steel balls dance about in a fantastic, eye-catching manner is being distributed by S K F Industries, Inc., to dramatize the precision with which extremely small steel balls are manufactured. Each vial contains approximately 125 steel balls, 1 millimeter in diameter, such as are produced in large quantities for use in ball-point pens and in timing and metering devices, including chronometers, motion picture cameras, gyroscopes, time clocks, seismograph pendulums, and similar mechanisms.

When rubbed briskly along a coat sleeve, for example, the plastic vial receives a charge of static electricity which attracts the balls to the side of the vial. A dancing, scrambling movement of the balls occurs when spheres of the same polarity repel each other.

The balls are so small that 7000 weigh only one ounce; yet they are as valuable by weight as gold. Ten separate operations, including two precision grindings are required to produce steel spheres averaging within ten-millionths inch of being perfectly round.

Voice Controls Operation of Model Elevator

A model elevator car, 1 foot high, that responds to voice commands in either English or French has been built by the Westinghouse Elevator Division, Jersey City, N. J. The bilingual elevator travels up and down between three floors in a 10-foot high model hoistway at the voice commands of the operator.

The passenger cab and hoistway were made complete with working miniatures of all the standard equipment found in elevator installations. The company is not planning to build voice-controlled elevators, the model being constructed merely to demonstrate the sensitivity of modern elevator controls.

INSTRUCTIONS FOR GRINDING CARBIDE-TIPPED CUTTERS								1/1 Ko 45-103
Cutter Numbers								
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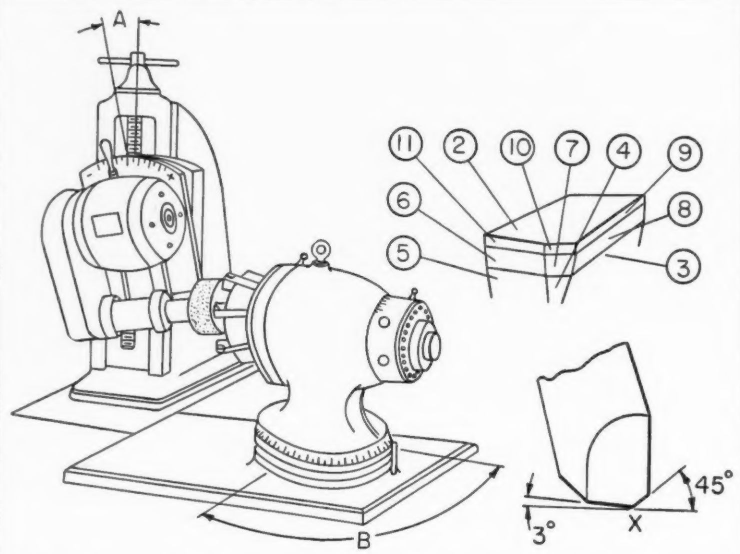
37	38	39	40	41	....	....	....	....



Axial rake = 10 degrees negative Radial rake = 8 degrees negative

	Operation	Type of Grinding Wheel	Angular Positions of Wheel and Work, Degrees		Remarks
			Angle A	Angle B	
1	Mounting of cutter-head	....	......	....	
2	Grind top rake	Diamond D120-N100-M1/8	+ 8r + 8l	100r 260l	Alternate silicon-carbide C60-K5-V for rough-grinding
3	Grind front clearance	Aluminum-oxide A60-K5-V	+ 15r — 15l	270r 270l	
4	Grind front clearance	Aluminum-oxide A60-K5-V	+ 15r — 15l	225r 225l	
5	Grind front clearance	Aluminum-oxide A60-K5-V	+ 15r — 15l	177r 177l	
6	Grind front clearance	Silicon-carbide C60-K5-V	+ 10r — 10l	177 ½r 177 ½l	
7	Grind front clearance	Silicon-carbide C60-K5-V	+ 10r — 10l	226r 226l	Length of chamfer about 0.118 inch
8	Grind front clearance	Silicon-carbide C60-K5-V	+ 10r — 10l	271r 271l	
9	Grind front clearance	Diamond D120-N100-M1/8	+ 5r — 5l	271r 271l	Width of land 0.019 to 0.039 inch
10	Grind front clearance	Diamond D120-N100-M1/8	+ 5r — 5l	226r 226l	
11	Grind front clearance	Diamond D120-N100-M1/8	+ 5r — 5l	177 ½r 177 ½l	

Instruction Chart Simplifies Grinding of Milling Cutters

By HANS A. BRANDERS

THE accompanying chart was devised in order to reduce the expense of grinding and sharpening carbide-tipped milling cutters and also to make use of unskilled labor for this work. A primary consideration in designing the chart was to provide simple, clear instructions, and to insure that the fewest possible variable factors will enter into the choice of grinding wheels and the correct positioning of the cutters in the cutter grinding machine.

Each type and make of cutter requires individual instructions. The instruction charts are numbered in the upper right-hand corner. Every cutter in use is given a number, the cutter numbers being shown just under the title of the instruction chart. A cross-index is thus provided whereby it is possible to quickly determine the chart to use for any particular cutter.

The variable factors involved in cutter grinding include the cutters, the grinding wheels, the angle of inclination for the grinding wheel spindle *A*, and the angular position of the tool work-head *B*. This information, together with any special remarks that may be necessary, is provided in the main body of the chart.

The chart is based upon the use of European cutter-grinding equipment, which affords a means of swiveling the wheel in a vertical plane and raising or lowering it.

Instructions for left-hand and right-hand cutters are given on the same chart, the letters *r* and *l* being used to indicate which type is referred to in the columns showing the angles *A* and *B*.

Battery of wire-drawing machines in the new stainless steel wire mill of the American Steel & Wire Co., which are equipped with finishing blocks that can be operated at speeds of 300 to 900 feet per minute in the production of wire as fine as 0.014 inch in diameter

New Stainless Steel Division of the American Steel & Wire Co.

STAINLESS-STEEL wire 1/2 inch in diameter and finer, as well as certain sizes of flat wire, are produced in a new stainless steel mill which has recently been placed in operation at the Waukegan, Ill., Works of the American Steel & Wire Co. With a rated capacity of 500 tons per month, the new Stainless Steel Division constitutes one of the largest stainless-steel wire producers in the country.

The plant begins its manufacturing processes with coils of hot-rolled stainless-steel wire rods which are rolled at the Joliet Works of the concern from steel billets made in the electrical furnaces of the South Chicago Works of the Carnegie-Illinois Steel Corporation. From the coils of hot-rolled rods, the Waukegan Works draws the wire down to gages almost as fine as a human hair.

An improved method of precision investment casting developed by Electronicast, Inc., Chicago, Ill., includes the use of polystyrene for patterns in place of wax. The electronic casting machines shown in the illustration are used for the induction heating of such metals as various S A E classifications of mild and stainless steels, as well as vanadium and other alloy steels, to an exact pouring temperature. Non-ferrous materials, such as beryllium copper, brass, aluminum, and manganese bronze, have also been successfully cast. Either centrifugal force or a high degree of vacuum is used to force the molten metal into the molds, depending on the design of the part

Timken Celebrates Fiftieth

AN important feature of the fiftieth anniversary celebration of the Timken Roller Bearing Co., Canton, Ohio, was a public showing of all the company's manufacturing facilities during the week of June 20 to 24, inclusive. Employes and their families, as well as townspeople, were cordially invited to visit the plants of the company located at Canton, Columbus, Zanesville, and Wooster, Ohio; Colorado Springs, Colo., and St. Thomas, Ontario, Canada. A preview for customers and members of the press was held on June 16 and 17.

Tours through the plants were efficiently handled, so that visitors could see the multitude of operations performed in the production of bearings, from the pouring of steel to the final bearing inspection and shipping operations. Signs suspended over many machine tools gave the original purchase price of the equipment and also the sum of money that would be required to replace the same machine at the

(Above) Machining operation being performed by a King boring mill on a large bearing cup in Gambrinus factory of Timken Roller Bearing Co. This machine can handle bearings 72 inches in diameter

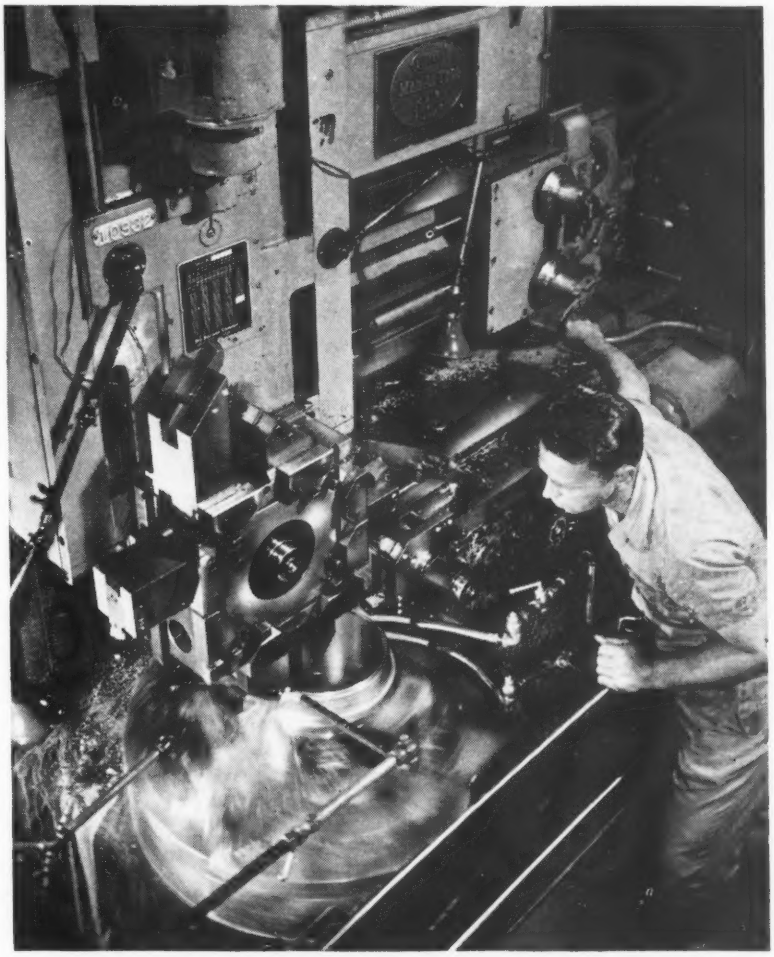
(Left) Electronic sound-gaging devices enable blind employes to efficiently inspect bearing parts that are held to close dimensional tolerances

Anniversary with Plant Tours

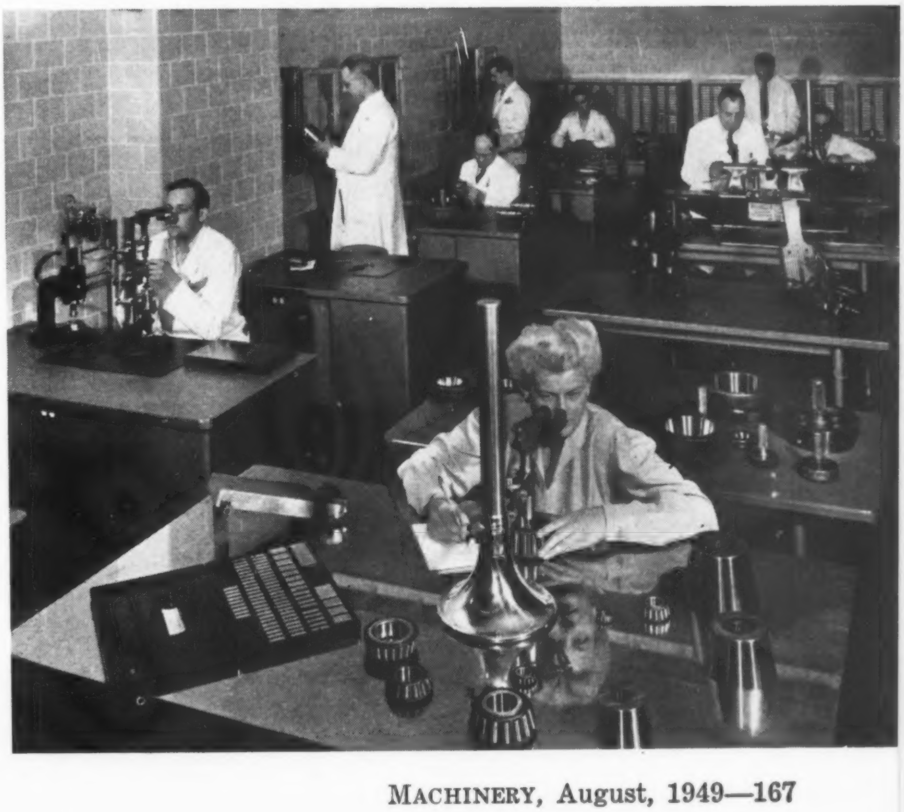
present time. These signs created considerable comment; they impressed on workmen and visitors the substantial amount of money that must be invested to give even one man employment, and the huge amount that must be set aside by a large company from earnings in order to replace equipment as it becomes worn out.

The taxes that the company must pay every day to the Federal Government—$58,179—were demonstrated in a dramatic manner. A transparent plastic box several feet in length, height, and width was filled to the top with silver dollars, and bags of silver dollars were stacked in front of the box to show the immensity of such a sum of money. Also, a sign suspended from a vertical boring mill pointed out the number of new machines of that type the company could buy to replace old models with one week's taxes.

Typical operations seen by the visitors during the plant tours are shown in the illustrations.



(Above) Forming a double-end cone for a tapered roller bearing from a steel forging on a Bullard Man-Au-Trol vertical turret lathe in the Canton factory of the Timken Roller Bearing Co.



(Right) One section of the precision tool and gage laboratory, showing inspectors checking various gages required in making bearings

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Liquid Resin Seals Porous Metal Castings

A liquid resin for sealing porous, light metal castings has been announced by the General Electric Co.'s Chemical Department, Pittsfield, Mass. The new material, called "Permafil," was developed to enable foundries to salvage castings that would otherwise be rejected because of porosity, and to permit their use in applications involving oil or vapor pressures.

A polyester type resin, "Permafil" is changed to a tough, clear solid, free of voids, by the action of catalysts and heat. The castings are sealed by vacuum impregnation and a subsequent short oven bake. The new sealing material is said to have good storage life under recommended conditions. 201

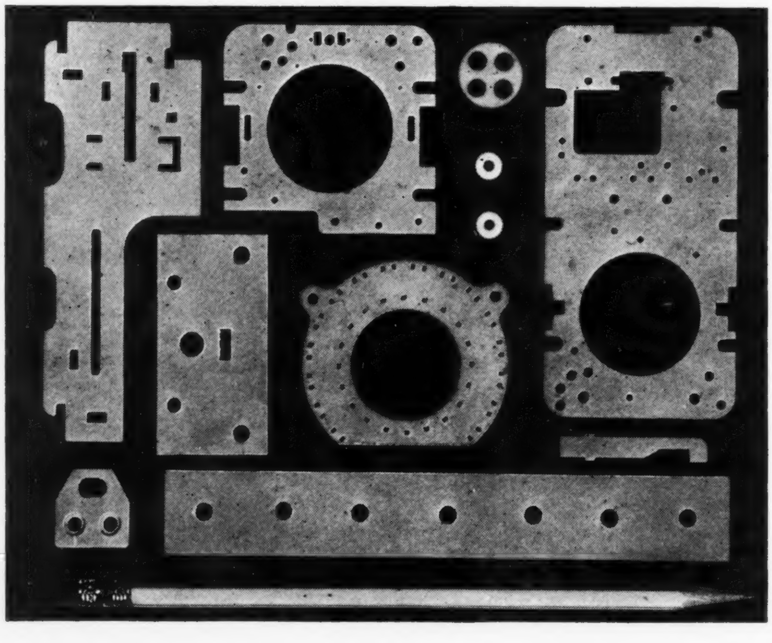
Improved Laminated Plastic for Gears and Cams

The Formica Co., Cincinnati 32, Ohio, has recently introduced an unwoven cotton fiber laminated plastic for use in making gears, cams, pinions, bearings, and similar industrial applications. The new plastic laminate, known as RN-30, is said to provide greater and more uniform mechanical strength, to machine better, and to have a smoother finish and better electrical properties than fabric-base laminated plastics in common use.

Woven fabric-base laminated plastics widely employed in mechanical and electrical applications in the past have a definite weakness; although they have good strength parallel to the weave in both directions, they have poor strength diagonally. Formica RN-30, on the other hand, has uniform strength in all directions, due to its matted, unwoven cotton fibers distributed evenly throughout the material. Because of this uniform physical characteristic, parts made from the new plastic will wear more evenly. Its smooth finish makes it particularly suitable for use in fine-tooth gears. 202

Industrial Bonding Process for Metals and Plastics

A process for bonding dissimilar materials in parts designed to withstand extreme lateral or internal hydrostatic and aerostatic pressures



Minute teeth in small gears and fine clean edges on other pieces illustrate the exceptional punching qualities of RN-30, the new Formica cotton mat base laminated plastic

has been developed by Western Sealant, Inc., Culver City, Calif. With this process, numerous parts can be handled simultaneously, resulting in a lower unit production cost.

It is primarily intended for bonding plastic or neoprene to metals, or ferrous to non-ferrous metals, as for example, in fastening bushings or inserts to members of aircraft, electronic, or hydraulic equipment. Special equipment and a new bonding agent are employed. In addition to bonding, the process also eliminates microporosity by impregnation with the bonding agent. Finished parts show no visible signs of treatment, and anodized, plated, or machined areas are not affected.

Such dissimilar materials as glass and metal, neoprene and metal, plastic and metal, steel inserts and aluminum, and brass and aluminum, as well as aluminum and aluminum, have been bonded by this process. At present, parts are being processed only at the Western Sealant plant, but equipment ranging from bench size to large production units is available. 203

Phosphate-Chromate Priming Coat for Rusted Metal Surfaces

A metal primer called "Ospho," which can be applied directly over rusted metal surfaces, has been developed by the Rusticide Products Co., Perkins Ave., Cleveland 14, Ohio. Upon application to rusted surfaces, this priming compound causes the iron oxide to change to iron phosphate, an inert, hard, dark gray substance. When a subsequent coating of paint is applied, it attaches itself so tightly to the primed surface that moisture and oxygen are prevented from attacking the metal. 204

Rubber Compounds Resist Oil, Grease, and Gasoline

Synthetic rubber compounds developed especially to resist the chemical action of petroleum products and other lubricants have been brought out by the Stalwart Rubber Co., 157 Northfield Road, Bedford, Ohio. These compounds, which are made with a base of Buna N, Hycar, or neoprene, can be fabricated into gaskets, sleeves, washers, tubing, molded products, and extruded cross-sections. Applications of the new compounds include fuel lines, dust covers, filters, channels, vibration dampeners, and many other products subjected to the chemical action of petroleum products.

Long life and minimum expansion under adverse conditions make these compounds suitable for a variety of uses in the automotive, aircraft, petroleum, electrical, chemical processing, and industrial equipment manufacturing industries. 205

Four Recently Developed Brazing and Welding Fluxes

The Victor Equipment Co., 844 Folsom St., San Francisco 7, Calif., has recently placed on the market four new brazing and welding fluxes. No. 3 flux is for brazing brass and bronze, steel, and clean cast and malleable iron. No. 5 flux is for moderate-heat brazing of cast and malleable iron. It does an excellent job of "tinning" dirty castings. No. 7 flux is for high-heat brazing of cast and malleable iron. No. 9 flux is for fast, effective welding of cast iron. It will not cake when the container is subjected to moderately high heat. 206

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in August, 1949, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME...POSITION OR TITLE...

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM..

BUSINESS ADDRESS...

CITY...STATE..

Testing Station a Valuable Source of Corrosion Data

THE corrosion testing station at Kure Beach, N. C., established by the International Nickel Co. in 1935, has proved to be a valuable means of determining the corrosion resistance of all kinds of ferrous and non-ferrous metals and alloys. The data accumulated during the years has been made available to industry, government agencies, and others interested. The testing is essentially a cooperative undertaking, involving both producers and users of metals. Atmospheric test racks have been set up by the Carnegie-Illinois Steel Corporation, the Dow Chemical Co., and the American Rolling Mills Co., in addition to the International Nickel Co.

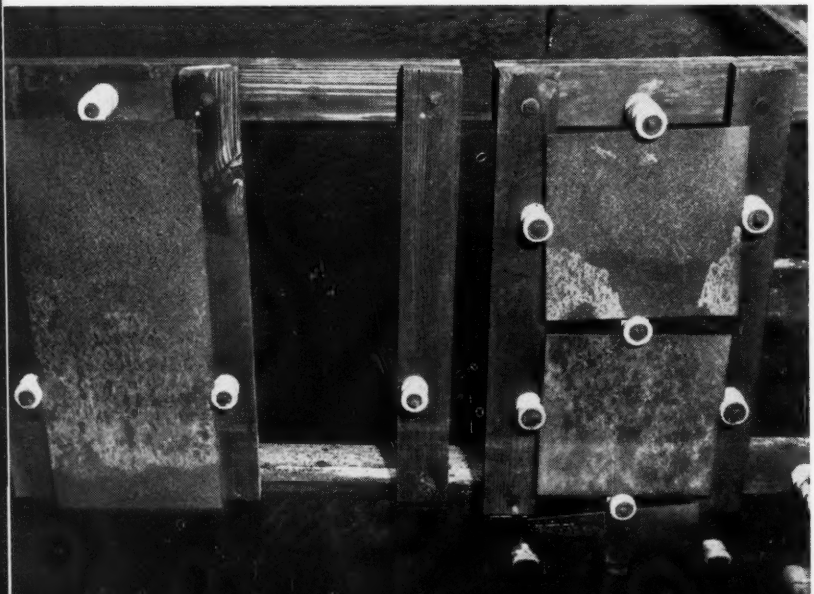
At the present time, the number of specimens exposed to atmospheric tests is approximately 15,000. About 2000 specimens are exposed to the action of sea water, and during the last twelve years, over 10,000 specimens have been so tested. The period of exposure varies from six months to several years, the longest period up to the present time being twelve years.

Most of the exposure racks are made of Monel or other corrosion-resistant alloys. Some of these racks have been in continuous use since the station was started. The progress of corrosion by salt water is determined by periodic measurements of the decrease in thickness of the steel. Effects of atmospheric corrosion are measured by visual observation and by determinations of weight loss or changes in mechanical properties.

A study of the anti-fouling characteristics of metals, alloys, plastics, and protective coatings has been an important phase of research during the last few years. This investigation has been conducted with the cooperation of Professor William F. Clapp, of the William F. Clapp Laboratories.

The need for more precise information on the ability of alloys to withstand the severe erosive effects associated with such uses as condenser tubes, pump impellers, propellers, etc., has led to the construction of special erosion testing apparatus.

One of the most important facilities at the Kure Beach testing station is the laboratory. This provides equipment for measuring loss in weight of samples, microscopic examinations, and the like. Each specimen is checked and an accurate record kept of time of exposure, location on racks, and performance.



(Above) Some of the 15,000 specimens exposed to a marine atmosphere at the Kure Beach testing station. Effects of atmospheric corrosion are measured by visual observation and by determinations of weight loss or changes in mechanical properties

(Left) Long steel specimens, such as the one seen at the left in this illustration, are sometimes exposed to corrosion by the salt water in which they are immersed and by the salt spray to which they are subjected above high-tide level. Galvanic action is avoided by mounting the specimens between porcelain insulators

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Simple Fixtures that Facilitate Crankshaft Inspection

By H. C. URBAUER, Freeport, Ill.

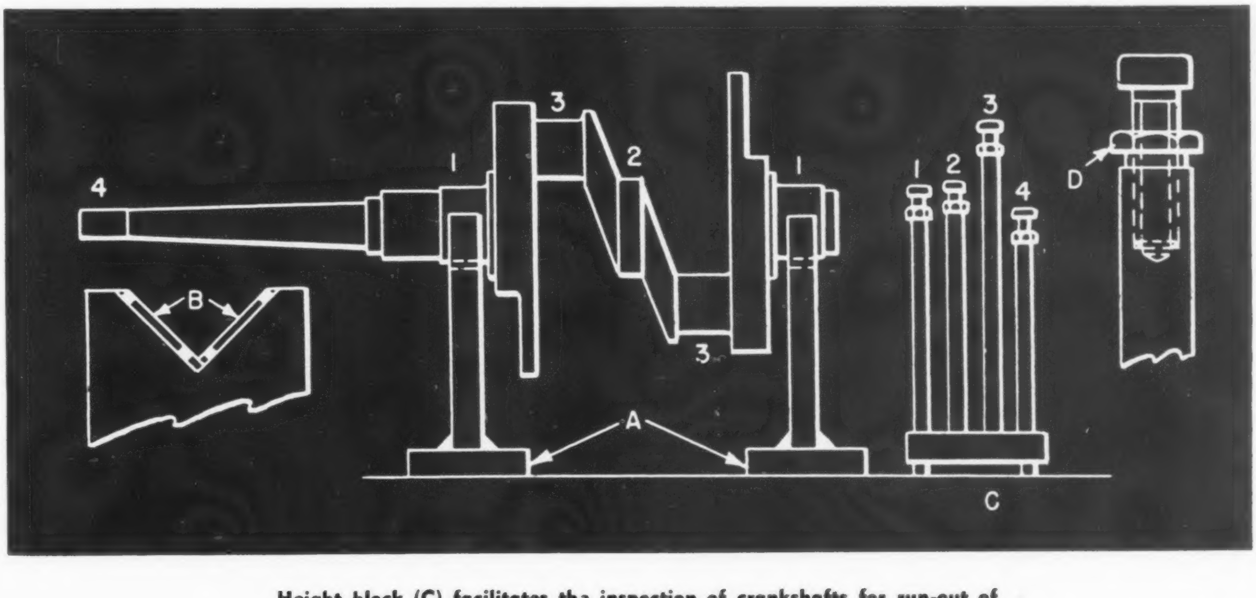
Fast, easy inspection of crankshafts is made possible with the equipment illustrated. The crankshaft is supported on a surface plate by a pair of V-blocks *A*, made from welded steel plates 1 1/2 to 2 inches thick. Half-hard brass plates, 1/2 inch thick, are mounted in the vees, as shown at *B*.

Each pair of blocks is planed together, both before and after assembling the brass plates, to insure their being the same shape and height. Bearing surfaces should be kept clean, and a drop of oil should be applied periodically to facilitate rotating the crankshaft, particular care being taken to remove all abrasive material from the surfaces of the V-blocks which come in contact with the crankshaft bearings.

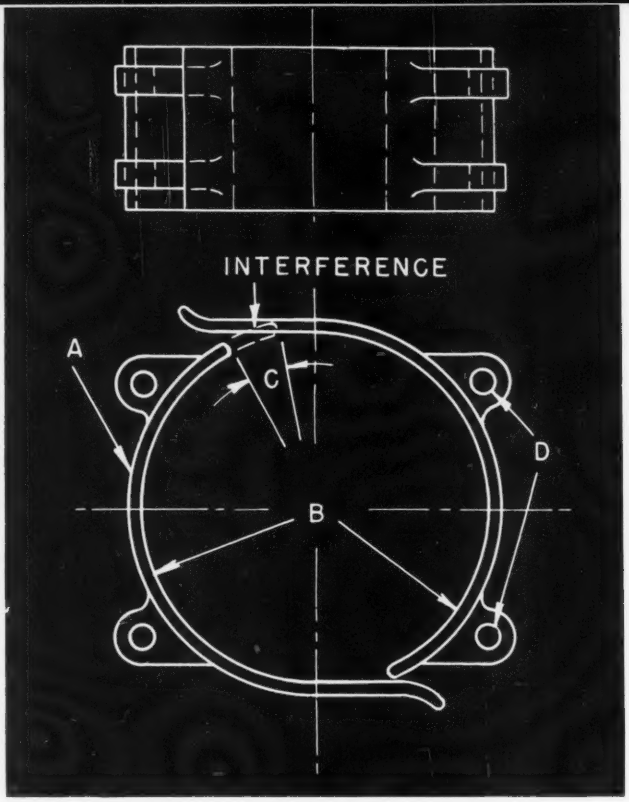
Height block *C* consists of a cast-iron or steel base in which four vertical columns are screwed, which are made from 3/4-inch diameter cold-rolled steel. The tops of these columns are tapped to accommodate bolts, as shown in the enlarged view at the right. Each bolt is adjusted upward or downward to correspond in height with the surfaces indicated on the crankshaft by numbers 1 to 4.

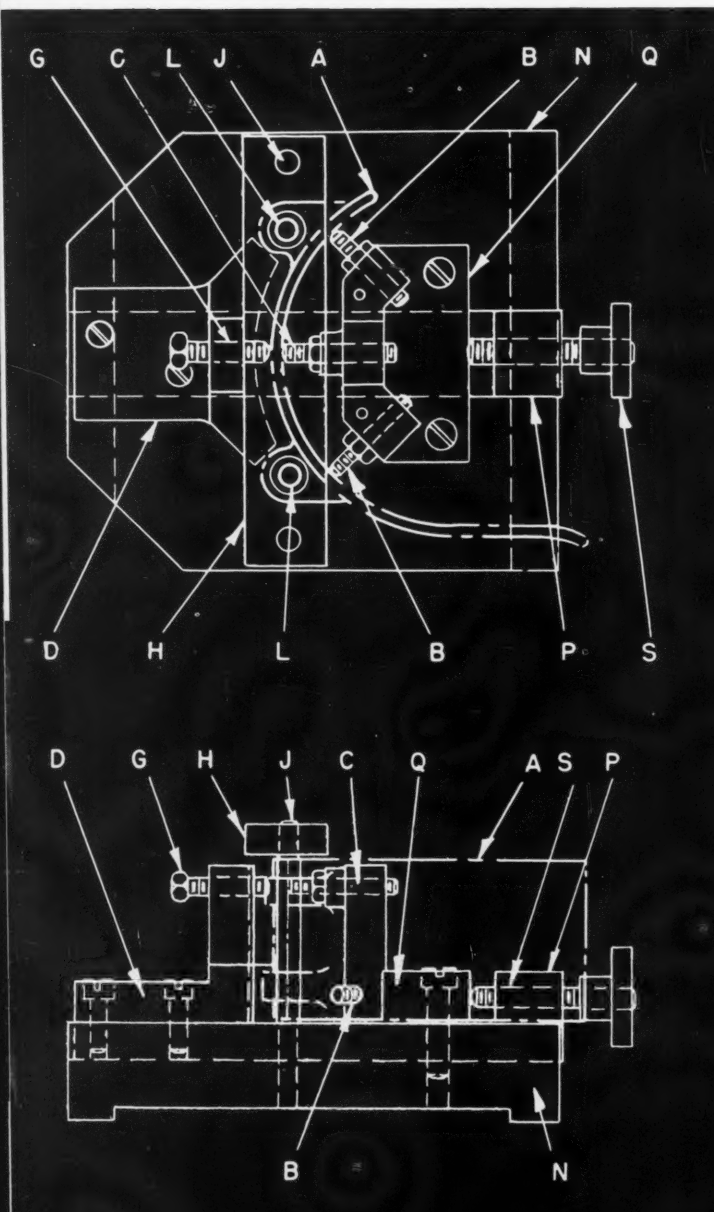
The correct height from the surface plate is determined with gage-blocks and an adjustable height gage equipped with a dial indicator. The height adjustment is maintained by tightening lock-nuts *D* and pouring hot sealing wax into the relief slots on the under sides of the nuts. The sealing wax also serves to indicate when the height adjustment has been changed, since the seal must be broken to move the bolt.

To check the crankshaft, an adjustable height gage with dial indicator is set so that the indicator will register zero when in contact with the selected column on the height block. The height gage is then moved to the corresponding surface on the crankshaft, and the crankshaft is rotated by hand to determine the run-out. This process is repeated to check the run-out of the various surfaces, the straightness of the crankshaft, and the throw of the cranks. Although the equipment described was developed for checking or inspecting crankshafts, it has been found readily adaptable to the inspection of a wide variety of work.



Height block (C) facilitates the inspection of crankshafts for run-out of specified surfaces, straightness of the shaft, and throw of the cranks





Modified Product Design Permits Simplified Grinding Set-Up

By F. H. MAYOH, Pawtucket, R. I.

Slight modifications in the design of a part frequently offer the simplest solution to difficult production problems. In this connection, design and production engineers should combine their efforts to develop an economical machining method. An example in which a small change in design facilitated production by permitting two of the parts to be ground simultaneously is described in the following.

By eliminating segment *C*, Fig. 1, from one edge of a cast guard *A*, two of the guards could be placed together, as shown, to facilitate grinding. The guards form part of a chute along which packages are conveyed by a chain. Close dimensional tolerances need not be maintained on these parts, with the exception of surfaces *B*, which must be smooth and accurately located with reference to mounting holes *D* in the two lugs on the part.

Prior to the grinding operation, the holes *D* in the lugs are drilled and reamed. The set-up for this operation is shown in Fig. 2. The cast guard *A* is placed on its side on base *N* of the fixture. To minimize the amount of stock to be removed in the subsequent "bore" grinding operation, the part is located from its inside radial surface by means of two screws *B* and one screw *C*, which are held in fixed block *Q*.

The work is centered on these screws by an adjustable block *D*, which acts as a wedge between the lugs. This centering block is secured to plate *P*, which can be moved in a groove provided in the base of the fixture by means of screw *S* acting against the end of block *Q*. The sliding plate is retained in the groove by the fixed block *Q*. When the centering block has been wedged against the lugs on the work, screw *G* is tightened to hold the part securely at its upper edge against screw *C*.

After locating and clamping the work, plate *H* is placed over posts *J* that project vertically from the base of the fixture. This plate contains bushings *L* through which the lugs of the casting are drilled and reamed.

Fig. 3 shows a fixture *C* mounted on the spindle nose of a conventional internal grinder, by

Fig. 1. (Top) By eliminating segment (C) from one edge of a cast guard (A), two of the guards can be placed together for grinding surfaces (B)

Fig. 2. (Bottom) Fixture for drilling and reaming holes in the lugs of cast guard (A). The guard is located by screws (B) and (C)

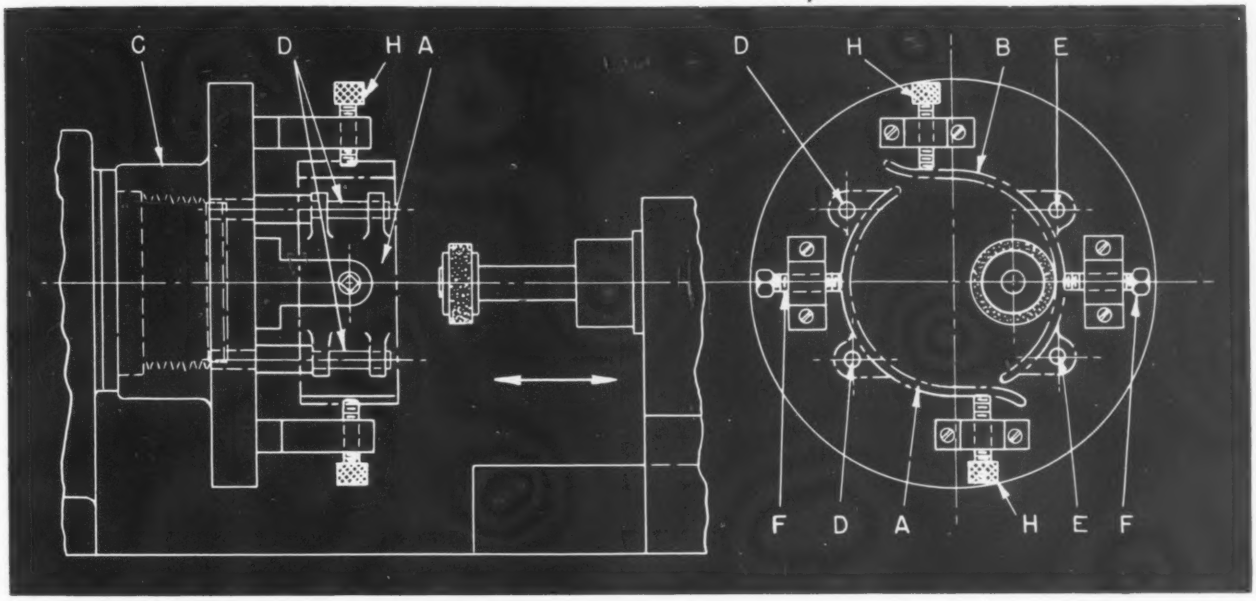


Fig. 3. Set-up for simultaneously grinding the inner radial surfaces of two guards, (A) and (B). The work is slowly rotated while the grinding wheel is reciprocated through the "bore"

means of which the inner radial surfaces of two guards are ground simultaneously. One guard *A* is supported on two pins *D* projecting from the face of the fixture, while the other guard *B* is held on two similar pins *E*.

The guards are clamped against these pins by tightening screws *F* with a wrench. Screws *H* are simply tightened by hand to bring them firmly in contact with the lips of the guards. The work and fixture are rotated slowly by means of the machine spindle while the rapidly revolving grinding wheel is reciprocated through the work.

Internal Spot-Facing Tool with Convenient Cutter Adjustment

By H. MOORE, Kirkstall, Leeds, England

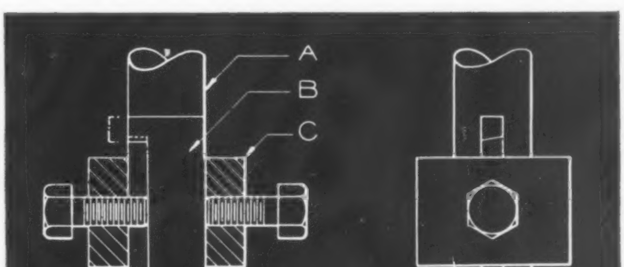
The tool shown in the accompanying illustration was designed for spot-facing the under side of bosses on a large number of parts whose shape did not permit the use of a standard spot-facing tool. Adjustment of the cutter so that it can be inserted in and removed from the work is the principal feature of this tool.

Three main parts consisting of the body *A*, cutter *B*, and collar *C* comprise the assembly. The body is slotted through to provide a slide fit for the spot-facing tool, which has a cutting edge at each end, so that it can be turned over when one end is worn. The collar is a drive fit on the body, and is tapped for two screws which bear on each side of the cutter.

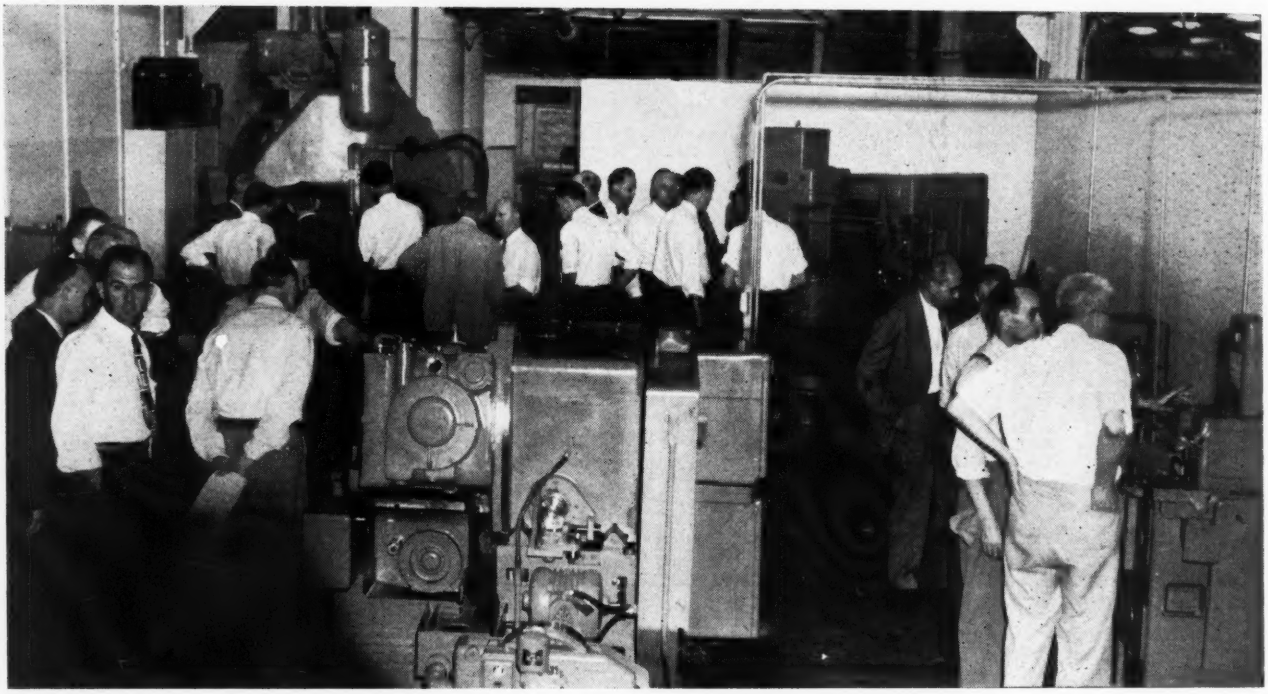
To adjust the cutter so that it can be inserted in the work, the screws are turned, one in and one out, until the cutter is centered in the slot in the body of the tool. In this position, there is no interference from the projection on the cutter. After the tool has entered the work and the cutting edge is below the surface to be faced, the operation of the screws is reversed to move the tool into the cutting position illustrated. Removing the tool from the work after the internal boss has been faced is accomplished by adjusting the screws in the same manner as when the tool is inserted in the work.

* * *

Electric street cars were first used in Richmond, Va., in 1888. At that time 100,000 horses and mules were pulling street cars in cities.



Tool for spot-facing internal surfaces can be adjusted to enable it to be inserted in the work or removed by turning two screws



Machine Tool Show in Vermont

OPERATIONS performed at spectacular cost-reducing speeds were features of exhibits held in plants of machine tool builders located in Springfield and Windsor, Vt., during the week of June 20 to 24, inclusive. The companies participating in this Vermont Machine Tool Show were the Jones & Lamson Machine Co., the Fellows Gear Shaper Co., the Bryant Chucking Grinder Co., and the Cone Automatic Machine Co., Inc.

One of the interesting demonstrations at the Jones & Lamson Machine Co. consisted of producing 13/16-inch body-bound bolts from 1 3/8-inch diameter S A E 1040 hot-rolled bar stock on a ram type flat turret lathe. The bolts were cut to an over-all length of 5 3/8 inches, with a 3/4-inch thread of ten threads per inch cut on one end of the bolt to a length of 1 1/2 inches. Through the use of a standard die-head equipped with carbide chasers, the thread was cut to a

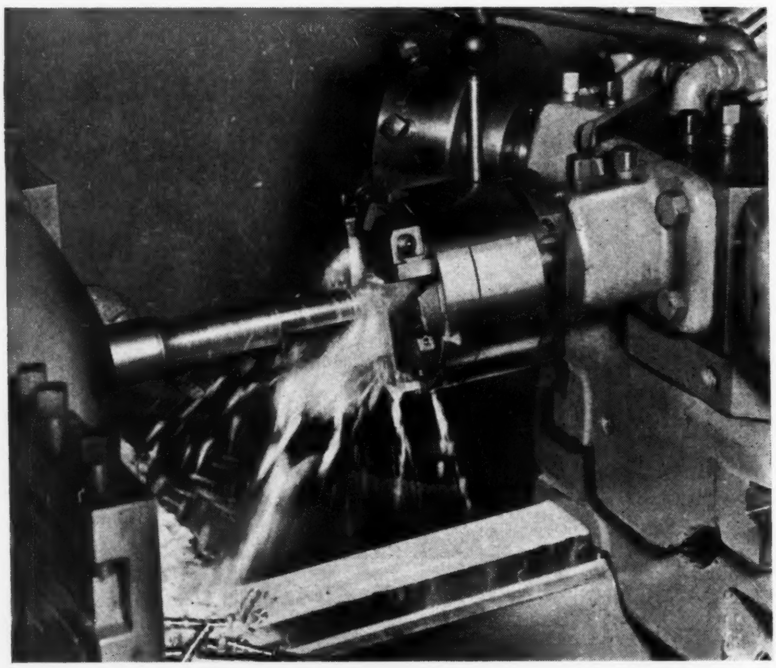


Fig. 1. (Above) One corner of the exhibit room where the Fellows Gear Shaper Co. demonstrated various types of gear cutting, finishing, and inspecting equipment

Fig. 2. (Left) Cutting a 3/4-inch diameter thread, ten threads per inch, for a length of 1 1/2 inches, in 1/3 second on a Jones & Lamson ram type turret lathe

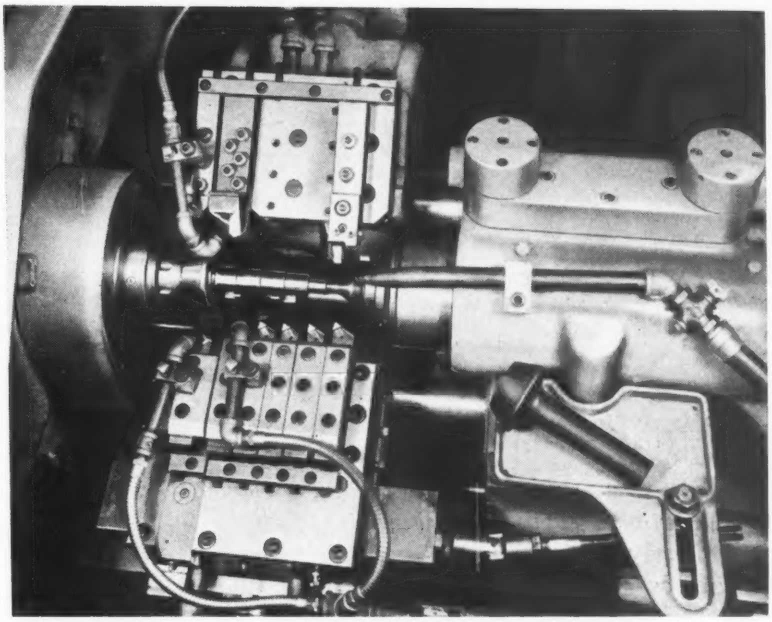


Fig. 3. Carbide tooling provided on a Fay automatic for complete machining of automobile driving pinions in a floor-to-floor time of 17 seconds. A rough forging is seen at the right and a finished piece between centers

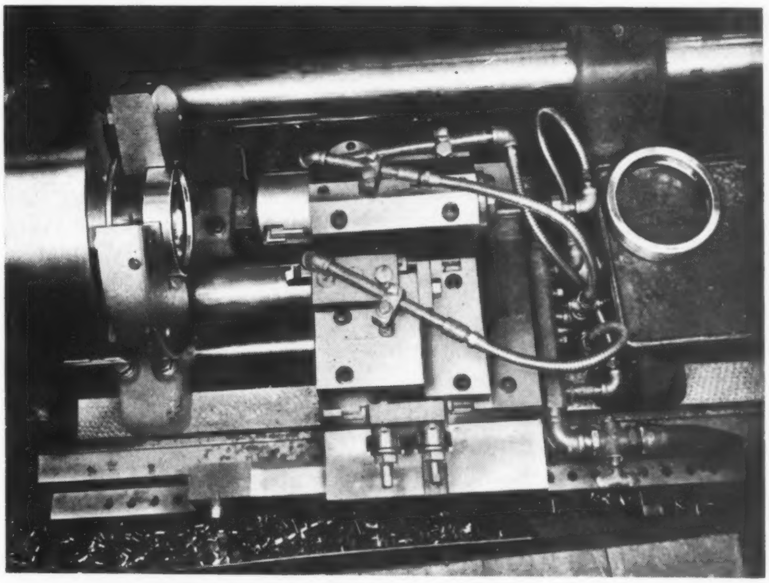


Fig. 4. Set-up on another Fay automatic lathe for forming the internal groove in bearing race. The floor-to-floor time is 15 seconds

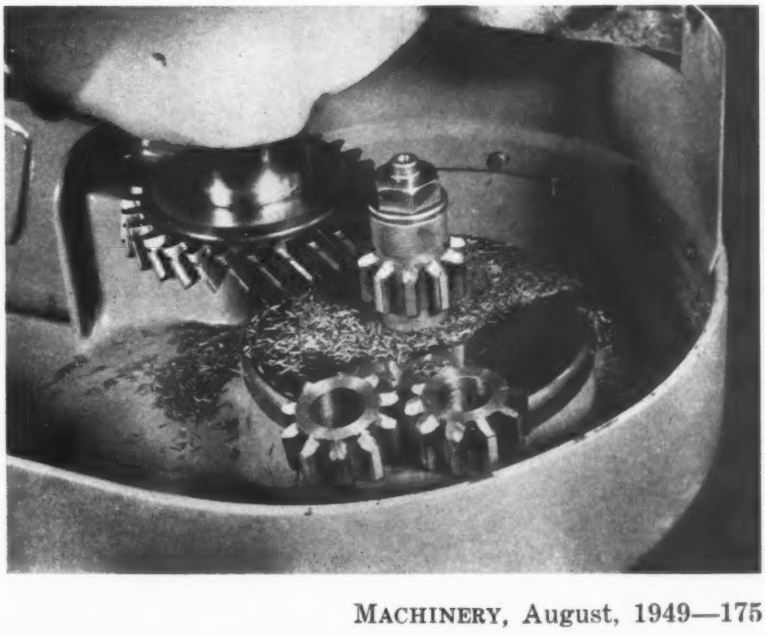


Fig. 5. The second of two Fellows gear shapers that are used to round both sides of the teeth of ten-tooth pinions in a total time of 1 minute

high degree of accuracy and finish within the remarkable time of 1/3 second. Fig. 2 shows this step of the operation in progress. The total time required to produce the bolt was only 1.7 minutes. A work-spindle speed of 2000 R.P.M. was employed.

Another operation of unusual interest in this plant consisted of completely turning and facing automobile driving pinion forgings in a 16-inch Fay automatic lathe in a floor-to-floor time of 17 seconds, the actual cutting time being only 8.5 seconds. This operation, which is shown in Fig. 3, was performed at a spindle speed of 1200 R.P.M., which resulted in a maximum surface speed of 1185 feet per minute. A maximum of 66 H.P. was used in this operation.

Other operations in this plant consisted of completely machining ball-bearing races 6 3/8 inches outside diameter from S A E 52100 rough forgings. The outside and inside turning, facing, and machining of an internal groove are performed in three operations in a total floor-to-floor time of 1 minute 10 seconds. The groove-cutting operation is shown in Fig. 4. A 6- by 30-inch universal grinding machine was demonstrated finishing threads with a multi-rib grinding wheel.

The exhibit of the Fellows Gear Shaper Co., which is partially shown in Fig. 1, included a variety of equipment for the production of gears and worms, the inspection of gears, and the sharpening of helical gear cutters. An injection molding machine was in operation producing parts for plastic toys. Small pinions were turned out by a 3-inch gear shaper at the rate of 600 per hour, the work-pieces being automatically loaded and ejected. Washing machine gears were cut on a six-spindle planetary gear shaper at high production rates.

Another outstanding feature of the exhibit was a No. 12 gear finisher incorporating new design principles. Worms were cut by thread generators and two gear shapers rounded the teeth on spur gears, one machine being employed for rounding one side of the teeth and the other unit for rounding the opposite side of the teeth. Fig. 5 shows the second machine in operation. Both machines are arranged with 45-degree helical guides and cutters. In the case of the ten-tooth pinion shown, the time for rounding all teeth on both sides was 1 minute.

A feature of the Bryant show was an automatic grinding machine used for finishing 7-millimeter bores. This machine was equipped with a high-frequency electrically driven wheel-spindle which ran at 90,000 R.P.M. Another grinding machine was provided with a loading mechanism for complete automatic handling of cup type needle bearings in grinding both the bore and face of the bearings. Still another machine was arranged for an extremely accurate grinding operation on fuel injection nozzles.

Bar type automatics with one, four, and six work-spindles, exhibited by the Cone Automatic Machine Co., Inc., emphasized high work yield per square foot of floor space. The machines had capacity for work from 3/16 to 5 inches in diameter and from 1/16 to 17 inches long.

Fig. 6 illustrates a 5-inch four-spindle Conomatic, which produced knurled closed-end round nuts 2 11/16 inches outside diameter by 2 5/8 inches long in an operation that involved the removal of 3.7 pounds of material from a section of bar stock weighing 4.95 pounds, the weight of the finished piece being 1.25 pounds. The cutting time per piece was 40 seconds. This machine was equipped with carbide tools throughout. It was driven by a 50-H.P. motor.

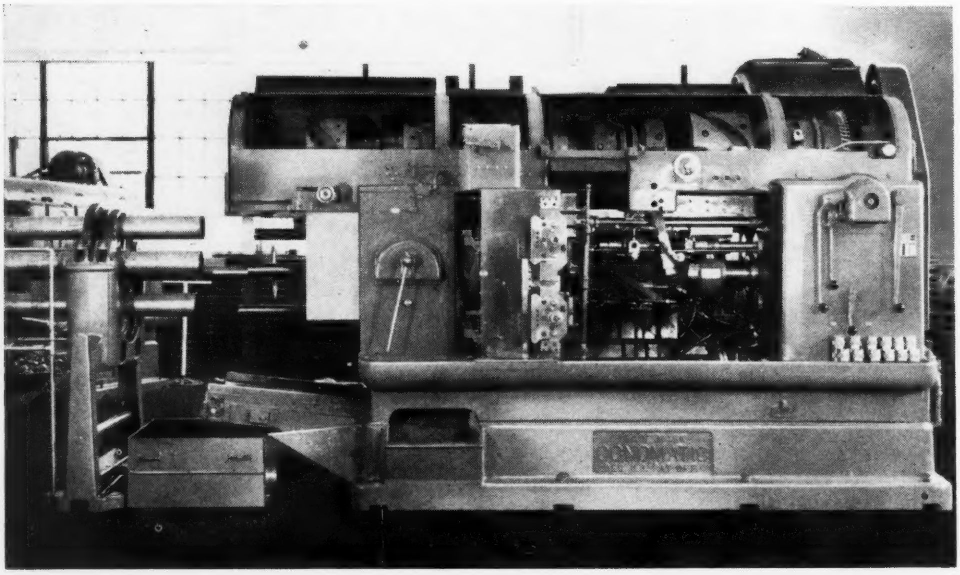


Fig. 6. Four-spindle Conomatic equipped for producing round knurled nuts from 2 3/4-inch round bar stock at a production rate of 90 pieces per hour, 3.7 pounds of material being removed from a section of bar stock weighing 4.95 pounds

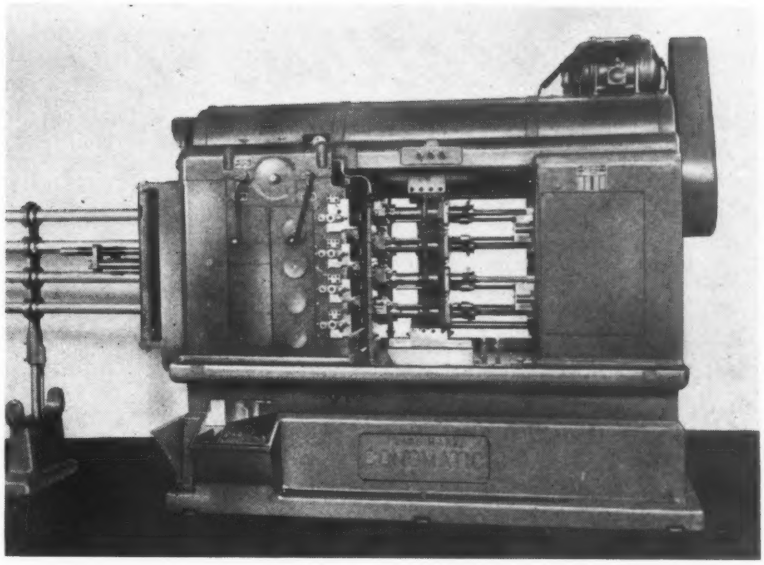


Fig. 7. Four-spindle "multi-single" Conomatic arranged for producing connecting links from bar stock at a gross production of 2400 pieces per hour

In another operation, a 1-inch six-spindle Conomatic produced 3/8-inch machine screws, 1 7/8 inches long under the head, from 9/16-inch hexagon stock at the rate of 2000 pieces per hour. The actual machining time per piece was 0.7 second and the idle time 1.1 seconds, making a total time per piece of 1.8 seconds. The spindle speed for turning and facing was 3820 R.P.M., and the effective threading speed, 4500 R.P.M. This machine was also completely equipped with carbide tools, including carbide chasers on the die-head.

Fig. 7 shows a 1 5/8-inch four-spindle "multi-single" Conomatic set up for producing small connecting links from 7/16-inch round stock at the rate of 2400 per hour. The material was S A E 1113 steel and high-speed steel cutters were used. The spindle speeds in this operation were 1950 R.P.M.

It will be seen that the machine is of the non-indexing type. The four horizontal work-spindles are arranged parallel in a vertical plane. The machine does the work of four single-spindle machines in the floor space that would be required by one single-spindle machine of the same bar stock capacity.

* * *

Standard Screw and Wire Gage

A screw and wire gage is being distributed by the Dayton Rogers Mfg. Co., Minneapolis 7, Minn., which shows the size of either wood or machine screws from Nos. 0 to 14, and corresponding diameters ranging from 1/32 to 1/4 inch. This steel gage is 3 inches long, 1 3/8 inches wide, and 1/16 inch thick. It is sent without charge if requested on a company letter-head.

Magnesium alloy parts being stretch-formed on a Hufford press at the plant of the Texas Engineering & Mfg. Co., Inc., in Dallas. The principal difference between stretch-forming magnesium and aluminum is that, in the former case, both the die and the part must be preheated. In this experimental operation, a Kirksite stretch die is preheated to 450 degrees F., after which the magnesium section is heated with a gas torch to approximately the same temperature. During the heating, temperatures are checked constantly with potentiometer pyrometers to insure even temperatures throughout the length of the part

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Thickness of Chillers for Casting "Ni-Hard" Parts

D.S.M. — In the production of "Ni-Hard" castings, is there any rule or formula that governs the thickness of the chillers to be used, in proportion to the section thickness or size of the casting being made?

Answered by Editor, "Nickel Topics," Published by International Nickel Co., Inc., New York City

We do not know of any detailed study having been made on this problem, but the general rule that has been followed and that seems to work out satisfactorily is to make the chiller thickness about equal to that of the casting section. For example, if you are casting a "Ni-Hard" roll head which ranges from 4 3/4 to 6 1/2 inches thick, a chiller about 5 1/2 inches thick should be adequate.

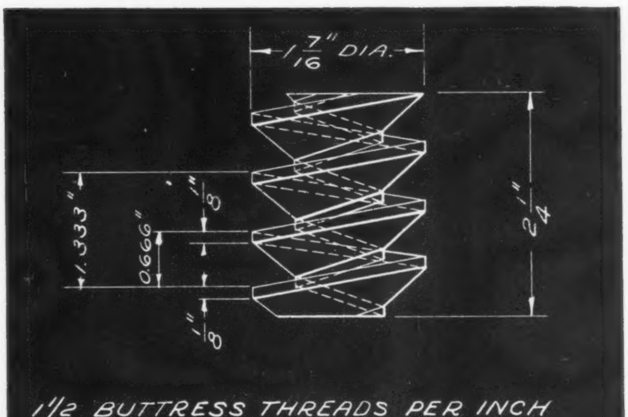
How Can Jamming of Stock in Progressive Dies Be Eliminated?

F. E. D.—We are experiencing difficulty in feeding coiled stock through a progressive die because of the tendency of the stock to jam between the guides. Before starting the press, the stock can be readily fed through the die between the guides, but when the press is in operation, the stock frequently becomes jammed. Any suggestion as to how this difficulty can be eliminated would be greatly appreciated.

Answered by Harold F. Fehlberg, Design Engineer Tech-n-Kal Machine & Engineering, Detroit, Mich.

The writer read with interest the answer to this question on page 182 in May, 1949, MACHINERY. The answer was well stated, and application of the instructions it contained would prevent certain difficulties. However, to fully protect the operator from injury and completely eliminate the possibility of damage to the press, dies, or work, the writer suggests that an electrically actuated clutch operator be installed on the press.

Regardless of whether the press is equipped with automatic feed or is fed by hand, the stock must reach the correct operating position in a progressive type die before the ram descends, in order to insure the safety of the operator and prevent damage. This safe operating condition can be achieved by the proper installation of a "Micro-Limit" switch in series with the button- or foot-operated control of the electrically actuated clutch. This arrangement is also being used successfully on sliding dies.

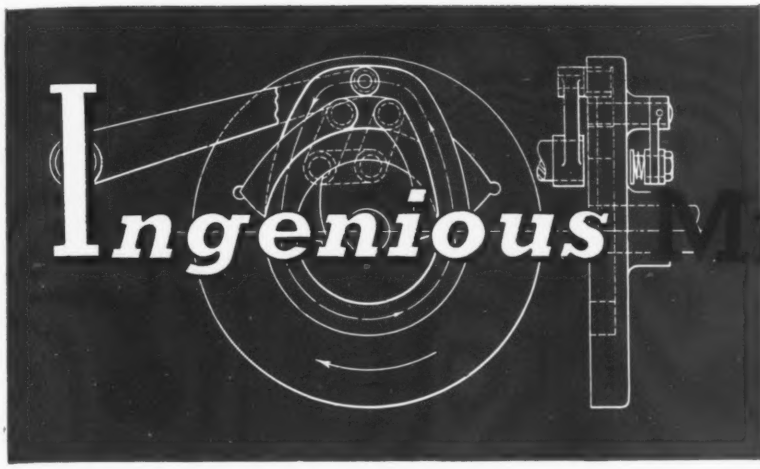


What is the Most Efficient Way of Producing This Buttress-Thread Part?

A. H. B.—The cold-rolled steel part with buttress thread shown in the accompanying illustration is to be made in lots of 10,000 to 50,000 pieces, after which the parts are to be casehardened. Suggestions as to whether they can be made most efficiently by thread rolling, grinding, or milling will be appreciated.

* * *

The new proposed American Standard for Single-Point Tools and Toolposts is available for comment and criticism by industry. Copies of the tentative draft can be obtained from S. A. Tucker, standards manager, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.



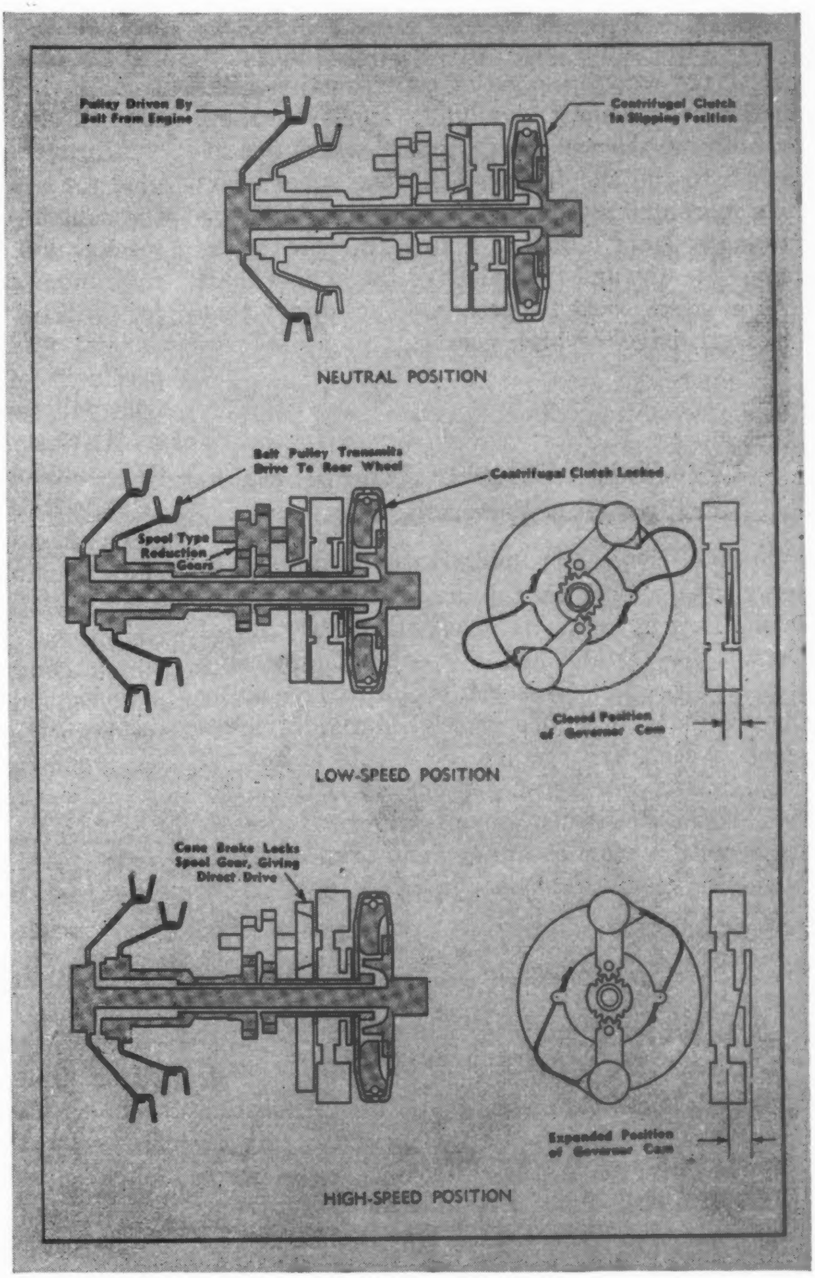
Ingenious MECHANISMS

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Automatic Transmission Designed to Maintain Constant Load

The accompanying illustration shows diagrammatically a fully automatic power transmission mechanism designed for high mechanical efficiency and to maintain a constant load. This new transmission, developed by Powermatic, Inc., Akron, Ohio, has several features of unusual interest. It is designed to "sense" the need for a change in gear ratio and to shift gears automatically without any attention from the operator. The mechanism maintains a constant load, even during the automatic gear-shifting operation, and accomplishes the gear shifting without the slightest shock. No hydraulic system, fluid coupling, band brakes, multiple-disk clutches, multiple valves, or similar parts that are ordinarily used in automatic transmission mechanisms are employed.

The new transmission is adaptable to any application requiring automatic speed changing. It can be built with various gear-ratio changes up to eight and in sizes for use in driving anything from railroad locomotives and deep-drawing presses to oil-well drilling equipment and automobiles. The design illustrated is being made in a two-speed transmission type with automatic clutch adapted for use on bicycle mo-



Diagrams showing automatic transmission mechanism in neutral, low-speed, and high-speed positions

tors, motorcycles, garden tractors, industrial trucks, electric motors, and similar applications requiring high starting torque.

Referring to the diagrams, the shaded areas are the parts involved in transferring power. When the motor is idling and delivering no power to the driven machine, complete slippage takes place in the patented automatic centrifugal clutch driven by the inner shaft. The clutch has only nine main parts, and is designed to compensate for wear. As the motor speed increases, the clutch gradually engages and power flows into the first half of the hollow shaft through a set of spool gears and out the second half of the hollow shaft to the power delivery pulley. The spool gears, turning freely, give a 1.7045 to 1 ratio for the low-gear drive.

When the motor speed reaches a certain point, a governor cam, operated by centrifugal weights on the hollow shaft, gradually applies braking pressure on the small cone brakes which are attached to the spool gears. As the spool gears turn more and more slowly, the gear ratio drops gradually from 1.7045 to 1 until the spool gears come to a stop and the halves of the hollow shaft are, in effect, locked together. The unit is then in direct drive, or high gear.

* * *

University of Detroit Establishes Engineering Research Council

In an effort to coordinate research and also to serve as an agency for solving research problems in the Detroit industrial area, the University of Detroit has established a special Engineering Research Council. Research problems frequently involve many branches of science and varieties of apparatus, and require the efforts of several departments working together. It is the function of the Research Council to unify these efforts, with a view to aiding industrial concerns in solving their problems.

* * *

New Officers of American Society for Testing Materials

At the annual meeting of the American Society for Testing Materials held recently in Atlantic City, N. J., the following officers were elected for 1949-1950: President, J. G. Morrow, The Steel Co. of Canada, Ltd., Hamilton, Ontario, Canada; and vice-president, Frank E. Richart, Research Professor of Engineering Materials, University of Illinois, Urbana, Ill.

Machine Tool Distributors to Celebrate Twenty-Fifth Anniversary

The silver anniversary of the American Machine Tool Distributors' Association will be celebrated with a banquet on October 31, to be held in the Roof Garden of the Hotel Gibson, Cincinnati, Ohio. The principal speaker scheduled for that occasion is Senator Robert A. Taft of Ohio, and the toastmaster will be Alexander G. Bryant, president of the Bryant Machinery & Engineering Co., who is a past president of the Association and also of the National Machine Tool Builders' Association. Following the introduction of Mr. Bryant by the incumbent president, Robert L. Giebel, of Giebel, Inc., New York City, individual certificates will be presented to representatives of the twenty-three founder companies who are still actively engaged in business.

A program of general interest has been scheduled for a session of the Association to be held the morning after the banquet. Speakers at that session will include Fred C. Dennis, partner of Lybrand, Ross Bros. & Montgomery, whose subject will be "How to Read Your Customers' Financial Statements"; William K. Beard, vice-president of the McGraw-Hill Publishing Co., who will speak on "Advertising"; and William A. A. Castellini, vice-president of Dinerman & Co., public relations counsel, who will discuss "Public Relations."

The first official meeting of the American Machine Tool Distributors' Association was held January 12, 1925. Since that meeting, the Association has held two conventions each year at which current problems of the industry are analyzed and suggestions made toward attaining the highest principles of business conduct. The present membership is 155 companies.

* * *

Motion Picture Shows Savings Effected with "Controlled Air Power"

A 16-millimeter sound motion picture entitled "Production Miracles through Controlled Air Power" has been produced by the Bellows Co., Akron, Ohio, to show cost reductions that have been effected in various manufacturing processes by the use of "controlled air power." Actual production scenes are shown, photographed in plants all over the United States. The film is available for showing without cost to plant executives. Further information can be obtained from W. C. Richards, Jr., Bellows Co., Akron, Ohio.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

Know What's on Your Prospect's Mind

TWO basic principles in selling appear to conflict. One is the necessity of selling *all* the advantages of the machine. The other, based on the fact that the average mind can grasp only a few impressions at a time, is concentration on one or two of the most important points. The only practical way the sales engineer can escape the "horns of this dilemma" is by knowing the particular prospect's interests and selecting arguments that will "click."

We are all, to a degree, like the group of blind men reaching out to touch some part of an elephant. Each gets a different impression. Each forms a different image. Opinions established from various experiences with machine tools shape the mind of each machine tool prospect and make each prospect different. The knack of successful selling is to discover early what is in the mind of the prospect, and then adroitly direct the sales argument to the interests of the individual. Knowing the prospect's problem, the sales engineer can use a rifle and not a shot gun; he can aim straight at the target and gage his shots.

Day-by-day experiences alter any prospect's interests. Recent events make his mind conscious and alert to a variety of requirements, any one of which may be inordinately important at the time. Bearing trouble may be fresh in his mind —or lubricating difficulties. Too much waste may have occurred on a job due to machining inaccuracies or failure to meet tolerances. An operator may have been hurt recently, making safety uppermost in the prospect's mind. A machine breakdown may have happened, and so the question of quick repair looms up as critically important. Inflexibility of a machine, or unwarranted retooling time may be a problem when work shrinkage necessitates that a machine handle a wide variety of work. Hence the job of the machine tool salesman is to find out what's on the prospect's mind. "Not so easy," you may say. But it is possible for any of us to improve our skill, save time, and increase selling efficiency greatly by studying each prospect and carefully analyzing what his immediate interests are.

One successful sales engineer figured out an approach that has been helpful in talking to shop operating men. He first gets the prospect to talk of his problems—his likes and his dislikes, holding his own mind in readiness, like a grappling hook, to seize a point of interest.

Having found a point of interest, he builds his selling argument on this one point as the major advantage of the machine he offers, illustrating it with details. Also, he cites examples of similar experiences of others, in which his machine has solved an identical difficulty.

Gaining the interest of the prospect, based upon the prospect's one problem, he adroitly slips in additional sales arguments, feeling his way and expanding these arguments according to the extent of the prospect's interest.

The importance of focussed selling, based upon customer interest, is well illustrated by an early experience in the motor sales field. Once I heard a prospect ask a salesman: "Do you build a pump motor?" The salesman's answer was: "No, but we build one that is all right to run a pump." Of course, the answer was wrong. It should have been: "Yes, that's exactly what we do build—a pump motor." What a different impression such a reply would have made on the prospect, whose only interest was a motor for driving his pump.

Get the prospect to talk. Size up his interest and problem. Then, when your turn comes, step forward with a convincing argument which shows that the design of your machine, and the basis of your recommendation, has been aimed precisely to solve his particular problem. This brand of psychology relating to human reaction saves time and helps to produce orders.

New Engineering Service Organized by Machine Tool Manufacturers

A new engineering service for Latin American industry has been organized by eleven prominent machine tool manufacturers through the incorporation, in the state of Ohio, of a concern to be known as Amertool Services. The purpose of the new organization, in addition to providing engineering service, is to extend terms of credit to Latin American industries. This has been provided for through an agreement with the Export-Import Bank for a revolving credit to finance orders up to a total of $3,000,000 for the group of companies. The foreign companies will be granted a period of eighteen months to pay for equipment purchased from any of the member companies.

The participating companies are the Blanchard Machine Co., Cambridge, Mass.; Cincinnati Lathe & Tool Co., Cincinnati, Ohio; Cincinnati Milling and Grinding Machines, Inc.; Cone Automatic Machine Co., Inc., Windsor, Vt.; Fosdick Machine Tool Co., Cincinnati; Heald Machine Co., Worcester, Mass.; Hydraulic Press Mfg. Co., Mount Gilead, Ohio; Jones & Lamson Machine Co., Springfield, Vt.; Monarch Machine Tool Co., Sidney, Ohio; National Automatic Tool Co., Richmond, Ind.; and Thompson Grinder Co., Springfield, Ohio.

The officers are: President, Nelson F. Caldwell, vice-president, Cincinnati Milling and Grinding Machines, Inc.; first vice-president, S. A. Brandenburg, vice-president-sales, Monarch Machine Tool Co.; second vice-president, J. C. Hebert, general sales manager, Jones & Lamson Machine Co.; secretary, D. R. Weedon, secretary and assistant manager, Blanchard Machine Co.; treasurer, R. M. Lippard, foreign sales manager, Heald Machine Co.; and assistant secretary, assistant treasurer, E. W. Mueller, secretary and treasurer, Cincinnati Lathe & Tool Co.

* * *

New Research Development Disclosed by Cincinnati Milling Machine Co.

The Cincinnati Milling Machine Co., Cincinnati, Ohio, has raised the curtain on an important research development—a new grinding wheel—which is disclosed in the current issue of the magazine *Report from Cincinnati Milling.*

Many previous publications and technical papers of the Cincinnati Milling Machine Co. have dealt with basic fundamentals in the study of metal-cutting action, and the *Report* tells how this basic research, heretofore applied to various types of single-point tools and milling cutters, can also be used for improving the cutting action of the abrasive grains in grinding wheels.

The efforts of the company's research engineers to improve the performance of abrasive grains as cutting "tools" in the grinding process have included an exhaustive study of the individual grains and their characteristics, together with the many variable factors that affect the wheels themselves. The engineers have been able to ascertain what are the desirable characteristics, and have studied such factors as pressure, friction, and heat, which are cumulative in their effect. Performance records have been established under everyday operating conditions on many types and sizes of grinding jobs.

The company states that the new grinding wheels are produced in limited quantities only, and are not available for the market.

Officers of the newly formed Amertool Services. (Seated left to right) S. A. Brandenburg, first vice-president; Nelson F. Caldwell, president; and J. C. Hebert, second vice-president. (Standing) R. M. Lippard, treasurer; D. R. Weedon, secretary

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

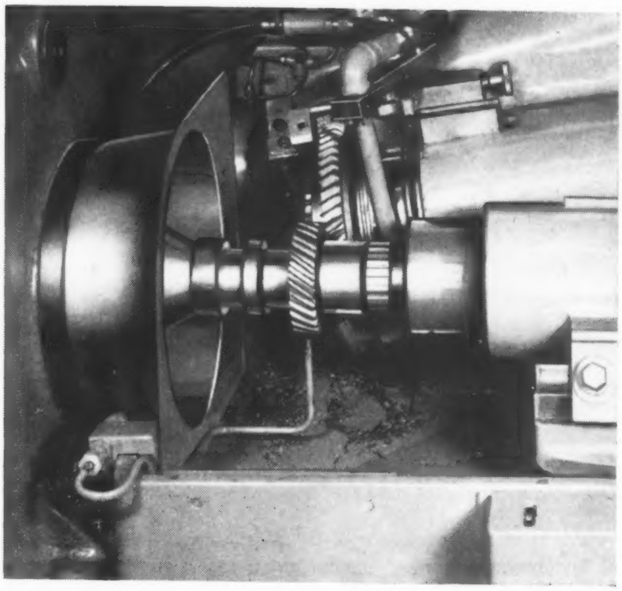


Fig. 2. Close-up view showing set-up for finishing an external helical gear on machine illustrated in Fig. 1

Fellows Spur and Helical Gear Finishing Machine

The Fellows Gear Shaper Co., Springfield, Vt., has developed a machine of entirely new design for finishing spur and helical gears. This machine, shown in Fig. 1, operates on a principle in which the cutter is set at an angle relative to the work, as seen in the close-up view in Fig. 2. One of the outstanding features of the new machine is the design of the cutter. These cutters, as shown in the upper view of Fig. 3, have teeth of helicoidal shape, and are sharpened by face grinding in a manner similar to that used in sharpening spur-gear shaper cutters.

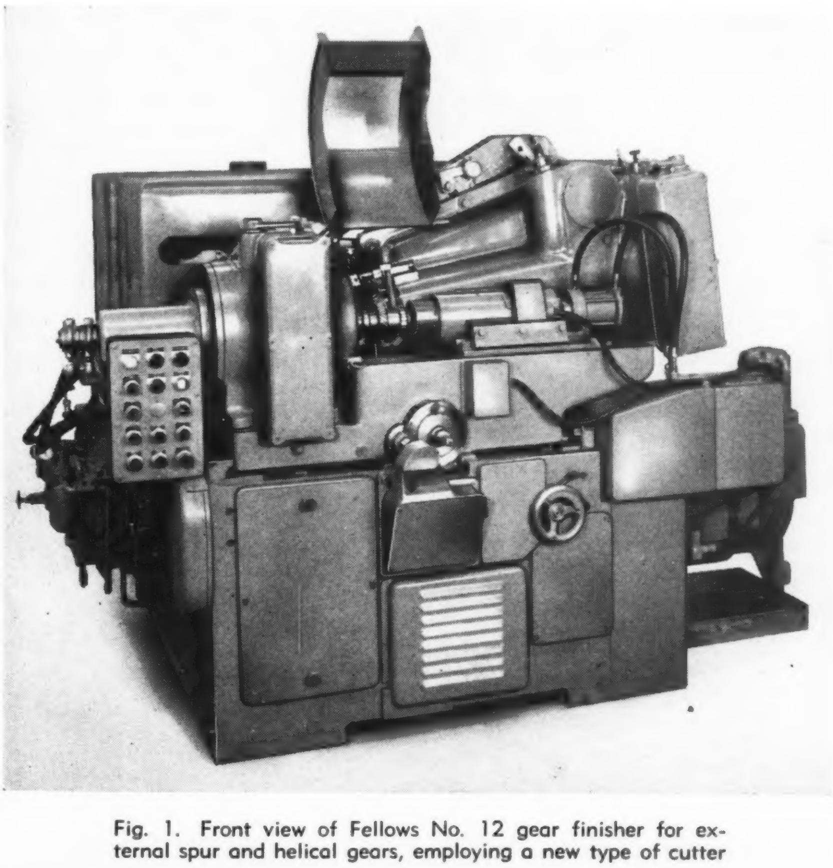


Fig. 1. Front view of Fellows No. 12 gear finisher for external spur and helical gears, employing a new type of cutter

An advantage of this type of cutter is its ability to cut freely, as is evidenced by the nature of the chips shown in the lower view of Fig. 3. This free cutting action results in no burnishing effect on the work. The cutter finishes both sides of the teeth in one traverse. While it is possible to remove considerably more stock from the sides of the teeth with this new process than with conventional shaving methods, cutter life is prolonged by keeping the stock allowance for finishing at a minimum.

The finish on the teeth of the work is governed to a large extent by the traverse feed of the cutter, which can be varied through change-gears to obtain any desired result. The traverse feed, within reasonable limits, has no effect whatever on the accuracy of the gear produced.

This machine is so designed that air-operated work-holding fixtures can be applied for clamping and unclamping the work, and it is also provided with a tailstock for supporting stem pinions. The machine is easy to set up and convenient to operate. It stops automatically when the cutter completes the traverse of the work and while it is in contact with the

To obtain additional information on equipment described on this page, see lower part of page 208.

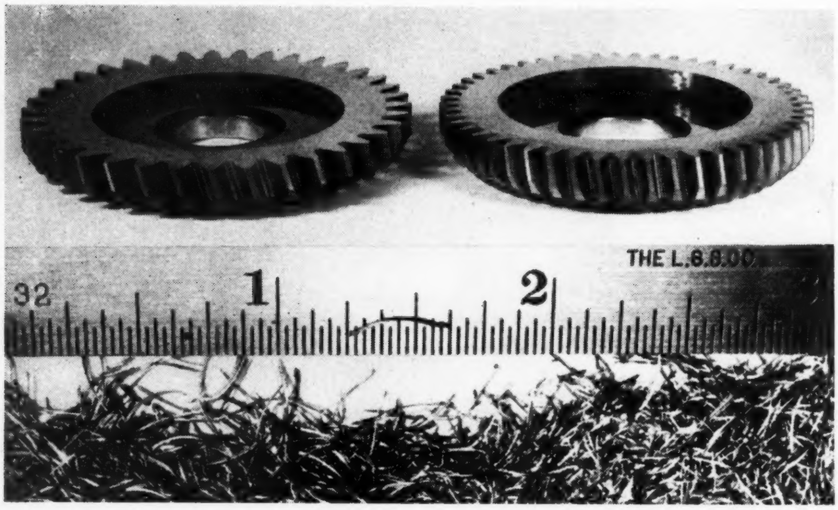


Fig. 3. (Upper View) Cutters used on No. 12 gear finisher, the cutter at the left being employed for helical gears and that at the right for spur gears. (Lower View) Chips removed by finishing cutter, indicating free cutting action

work. The finished gear is then removed and an unfinished blank inserted, the cutter thus acting as a setting gage for locating the teeth on the work in the correct position relative to those on the cutter.

The operating cycle is as follows: When the gear is completed, the machine stops automatically and the work backs away from the cutter an amount equal to the depth of cut. The operator elevates the safety guard, which breaks contact with the button controlling the air-operated clamping mechanism. He then removes the finished gear and inserts an unfinished gear. The start button which controls the clamping mechanism is then depressed, after which the machine is ready to start as soon as the safety guard is lowered.

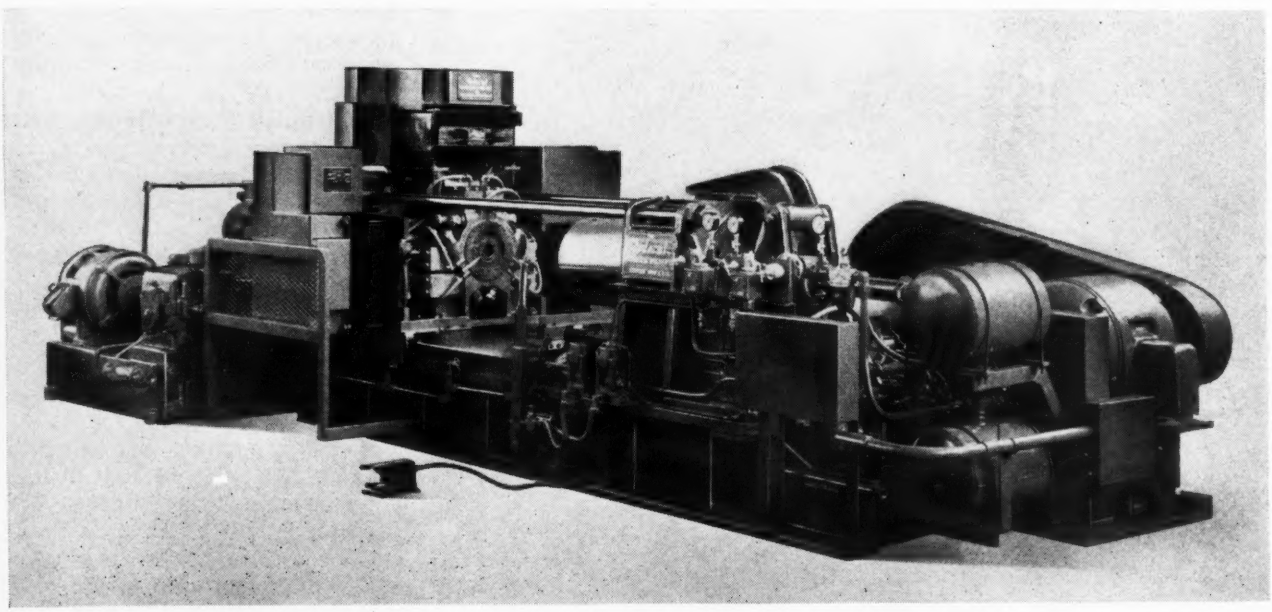
Cutter and work start rotating with a light clamping pressure on the work. After a short interval, full clamping pressure is applied, and at the same time, the work withdraws from the cutter, which is rapidly traversed across the work to the starting point. The work is then automatically advanced to the proper depth of cut and the cutter is traversed across the work at the desired feed. The machine is entirely automatic in operation, with the exception of loading and unloading the work. It is also automatically lubricated.

An important unit of the machine is a magnetic chip separator, designed to prevent chips from being carried in the cutting oil and thus marring the work finish. The maximum pitch diameter of work handled is 12 inches; maximum outside diameter, 12 1/2 inches; and maximum diametral pitch, 5. The maximum outside diameter of cutter is 7 1/4 inches; maximum face width, 8 3/4 inches; and maximum helix angle, 45 degrees.

The length of the machine is 7 feet 6 inches; depth, 6 feet 1 inch; and height, 5 feet 3 inches. The net weight of the machine, including motors and chip separator, is 11,700 pounds. 61

Machine for Closing Tube Ends

Only ten seconds is required to close the end of a 4-inch diameter tube having a wall thickness of 1/4 inch on the latest "Westin Process" forming machine built by the Federal Machine & Welder Co., Warren, Ohio. The use of removable dies makes this machine readily adaptable for a variety of work. Single-purpose machines for continued high production of a single part, are also available.



"Westin Process" machine manufactured by the Federal Machine & Welder Co. for tube-end closing operations

To obtain additional information on equipment described on this page, see lower part of page 208.

The machine is started by a push-button at the operating station, and completes the forming cycle automatically. For short runs of special work, manual operation can be employed, a selector switch with separate push-button being used to control the clutch, chuck, and electric current. In this case, a hand-lever is used to control the platen traverse. Stepless variable traverse speeds ranging from 0 to 100 inches per minute are available, and the eight-step spindle speed range is from 40 to 150 R.P.M.

Accurate control of forming temperatures provides even heating, which prevents work hardening and formation of strain flaws, thus eliminating the need for annealing and subsequent heating. Although generally made in nominal sizes to accommodate work ranging in diameter from 3/4 inch to 4 inches, 4 to 8 inches, and 8 to 16 inches, the machine can be built to handle tubing of almost any diameter or wall thickness. Brass, aluminum, copper, carbon steels, and most alloy steels, including stainless steel, can be worked by the "Westin Process" machine. 62

Moline Machine for Taper-Reaming, Chamfering, and Tapping Pipe Couplings

The Moline Tool Co., Moline, Ill., has recently built a two-way, four-unit, horizontal, hydraulic-feed machine designed for taper-reaming, chamfering, and tapping pipe couplings of various sizes. A six-station, manually operated, trunnion type fixture holds the work.

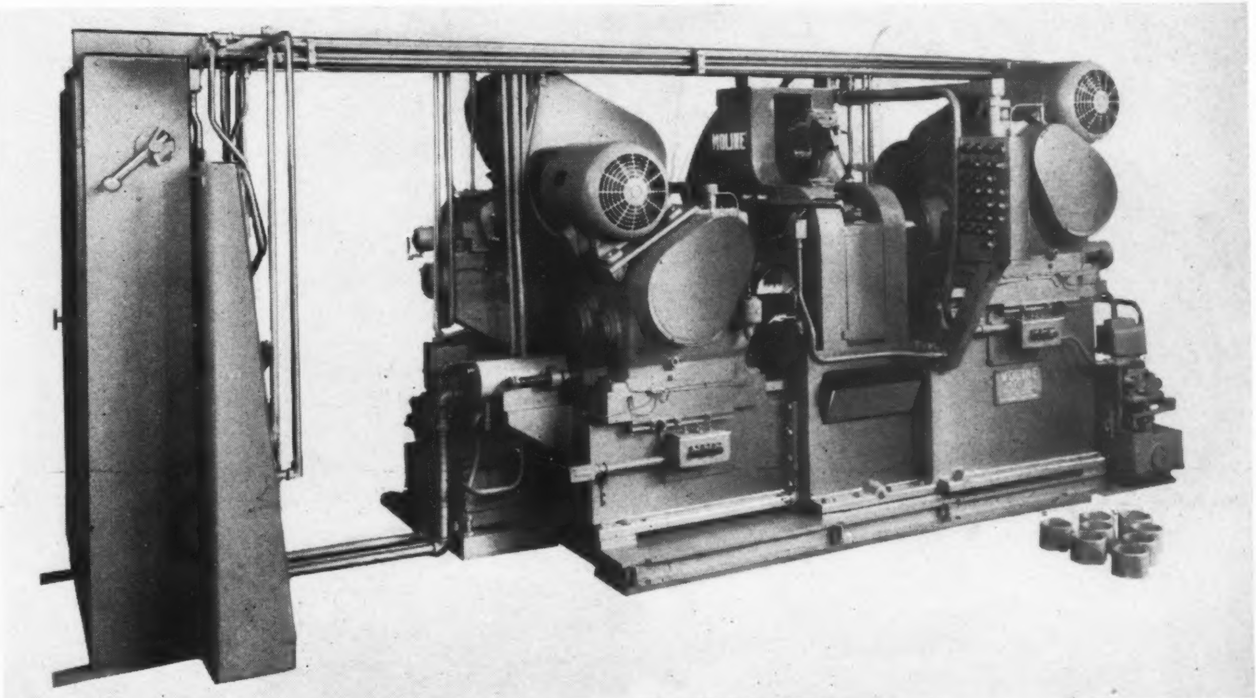
Reaming and chamfering operations are performed by combination tools, provision for a dwell being made for chamfering. Tapping units are advanced hydraulically to the work and engaged by lead-screw feeds for the tapping operations. Taps of the collapsing type are used, which permits hydraulic rapid withdrawal from the work.

Clamping jaws for holding 2½-, 3-, and 4-inch pipe couplings can be installed in the vises of the trunnion type fixture. While held in this fixture, the coupling blanks are taper-reamed and inside chamfered from each end. Tapping from each end follows these operations. The fixture has two boring stations, two tapping stations, and two idle stations, one of which is used for loading and unloading. Clamping of the work is performed manually by means of a quick-acting cam locking mechanism. Although all reaming and tapping units of the machine operate simultaneously, they are so located with respect to the fixture stations that each unit works exclusively in one particular station.

Control of the electrical and hydraulic units of the entire machine is concentrated in a push-button station. This station contains a green indicator light for each reaming and tapping unit. When this light comes on, it indicates that the particular unit is ready to begin an operating cycle.

After the various pump and spindle motors are started, it is unnecessary to touch the push-button station. The operator simply clamps a coupling blank in the loading station while the reaming and tapping operations are taking place at the working stations. When the four green lights appear on the push-button station, the operator withdraws the locating plunger from the fixture trunnion and manually turns it to the next position, after which the next operating cycle starts automatically. The plunger lever is electrically interlocked. This automatic starting feature can be discontinued by turning a switch from the "automatic" to the "manual" position.

One finished piece is produced



Machine built by the Moline Tool Co. for taper-reaming, chamfering, and tapping pipe couplings

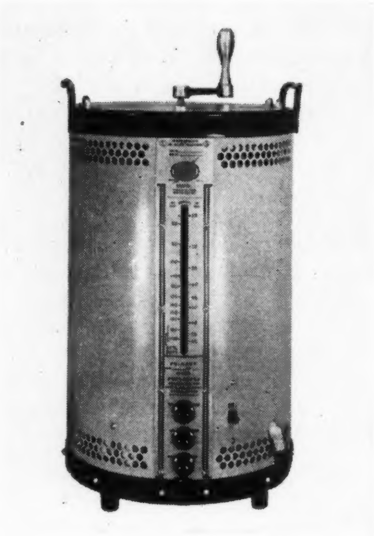
To obtain additional information on equipment described on this page, see lower part of page 208.

at each operating cycle. The machine illustrated is set for an operating cycle of 45 seconds, but this cycle time can be reduced. The machine and control panel assembly occupies a floor space of approximately 7 feet 10 inches by 15 feet 4 inches, and is about 6 feet 10 inches in height. 63

Wilson Arc-Welder

The Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has just announced a new alternating - current transformer type arc-welding machine designated the "Wilson 200-ampere max. MCT." This self-contained machine is designed to meet the demand of small shops and maintenance departments for an economical portable welder having a rated maximum output of 200 amperes.

It has two ranges of current adjustment with stepless control throughout each range. Capacitors are supplied in the secondary circuit to provide easy arc starting and arc stability. Capacitors are also provided in the primary circuit for power factor correction.



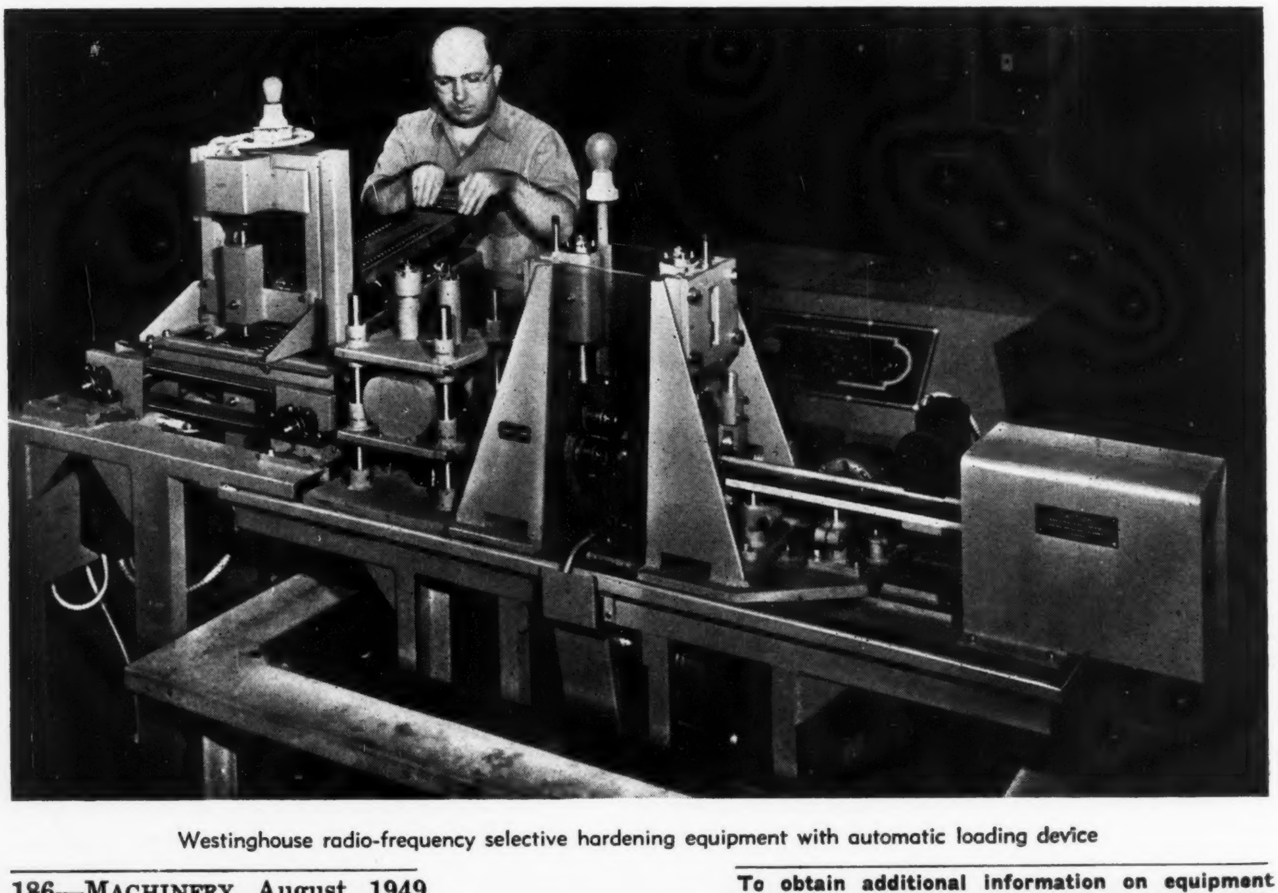
Wilson arc-welding machine announced by Air Reduction Sales Co.

Any desired setting can be made quickly and accurately by simply turning the crank-handle on top of the machine. A full-view scale facilitates the reading of current settings. The windings are insulated with heat-resistant spun-glass fiber. A primary "on and off" switch and a 10-foot length of rubber-covered cable with lugs attached are included with the machine. 64

Westinghouse Continuous Radio-Frequency Selective Hardening Equipment

Continuous selective hardening of cylindrical parts at feed rates up to 6 inches per second is possible with a radio-frequency hardening system recently developed by the Westinghouse Electric Corporation, 306 Fourth Ave., Pittsburgh 30, Pa. Operation of this system can be made completely automatic when the cylindrical parts are of such design that they can be fed by a hopper to an automatic loading device. When the work has been, turned, milled, or drilled in such a way as to necessitate positioning to insure hardening in the proper places, the magazine of the automatic loading device must be manually loaded. After hardening, the parts can be moved to the machine station for the next production step by a conveyor belt.

The equipment consists of three major components—an automatic loading device; a horizontal rotating scanner; and an industrial radio - frequency generator. The automatic loading device consists of a magazine designed to accommodate a particular cylindrical



Westinghouse radio-frequency selective hardening equipment with automatic loading device

To obtain additional information on equipment described on this page, see lower part of page 208.

part in its proper position (when positioning is unnecessary a hopper can be substituted); a gate release, which is solenoid-operated for dropping the work-pieces in succession on a conveyor belt; and a conveyor belt for delivering the work to the in-feed of the scanner. The horizontal rotating scanner feeds the work through the heating coil and spray quench assembly. Uniformity of case depth is obtained by controlled feed, and concentricity of the case is insured by a guide and by rotating the work about its longitudinal axis.

This equipment can be used to harden a wide variety of cylindrical parts in any desired pattern. Automatic selection of the proper electronic control to suit any particular part is made by a multi-prong plug attached to the magazine designed for the part. The equipment can be adjusted to handle shafts from 2 to 16 inches long and from 3/8 inch to 2 inches in diameter at feeding rates up to 6 inches per second, depending on the diameter of the shaft and the power output of the generator. 65

LeBlond "Clipper" High-Speed Automatic Lathe

Ease and simplicity of set-up is a major advantage of the new "Clipper" automatic high-speed manufacturing lathe introduced by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. In this machine, no cams are required for the average turning and facing job. The starting point of the cut is determined by a micro-length limiting switch on the bed, and the length of cut is controlled by a positive automatic stop on the trip-bar.

The automatic cycle is as follows: Plunging cut to depth; turning work for predetermined length; tool relieving; and rapid traverse return to starting position. The automatic features enable one man to tend several of these machines. Provision is made for quick change-over to semi-automatic or manual operation when desired.

With the completely automatic apron, a cross-feed mechanism moves the tools in and out electrically, and a positive, adjustable stop on the bridge of the carriage is set for the desired depth of cut. Longitudinal feed toward the headstock is engaged by starting the machine. The tools feed to depth angularly, and turning is then controlled by the regular feed mechanism. At the end of the cut, the apron engages a positive automatic length stop which actuates a time delay switch. This provides a time interval in which the tools are withdrawn or relieved and the apron returned to the starting position by the rapid traverse mechanism. At this point, the apron contacts the micro-length return limiting switch, which disconnects the entire circuit and stops the machine with the tools in position to receive a new piece of work.

A choice of three headstocks permits the machine to be precisely adapted to the user's requirements. The first or regular anti-friction head, designed for medium spindle speeds, has two ranges of six selective speeds each

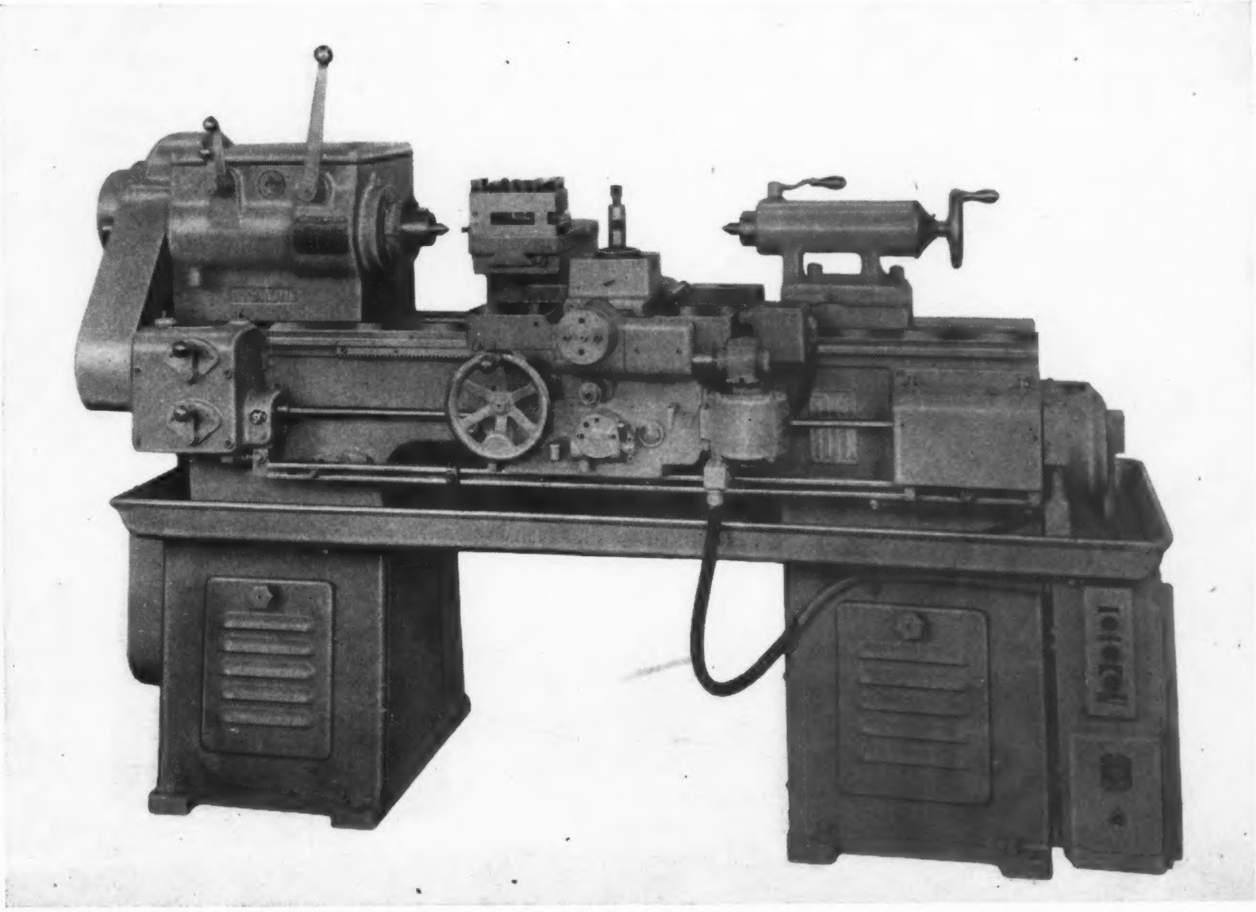


Fig. 1. New LeBlond "Clipper" automatic high-speed manufacturing lathe equipped with normal-speed geared headstock—one of three headstocks available with this machine

To obtain additional information on equipment described on this page, see lower part of page 208.

—68 to 400 R.P.M. or 102 to 600 R.P.M. The second or high-speed anti-friction head has two speed ranges, of 200 to 1200 R.P.M. or 250 to 1500 R.P.M., each with six selective speeds. The third or high-speed motor head has the motor built into the headstock, with the stator bolted to the casting and the rotor pressed on the spindle. This head is furnished with one of nine spindle speed combinations varying from 450 to 3600 R.P.M.

The swing over the bed and carriage wings is 14 7/8 inches. The bed is made in a 4 1/2-foot length when fitted with the anti-friction headstock. Beds with any one of the three types of heads can be had in longer lengths, increasing by increments of 1 foot. An automatic back-facing attachment, furnished as additional equipment, is coordinated with the apron to work in the regular automatic cycle. It can be positioned anywhere on the bed, power being taken from the feed-rod through the driving mechanism. Pick-off gears vary the length of cross-travel in relation to the length of carriage feed. 66

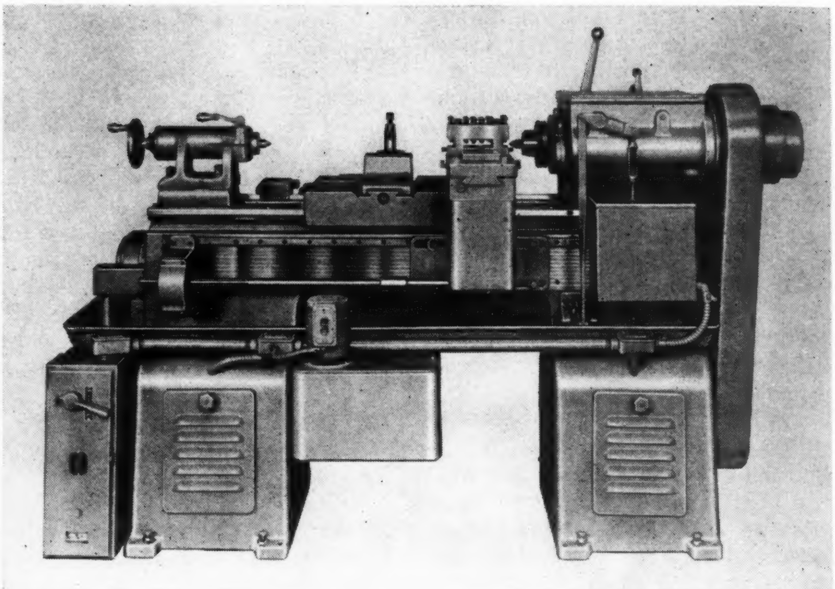
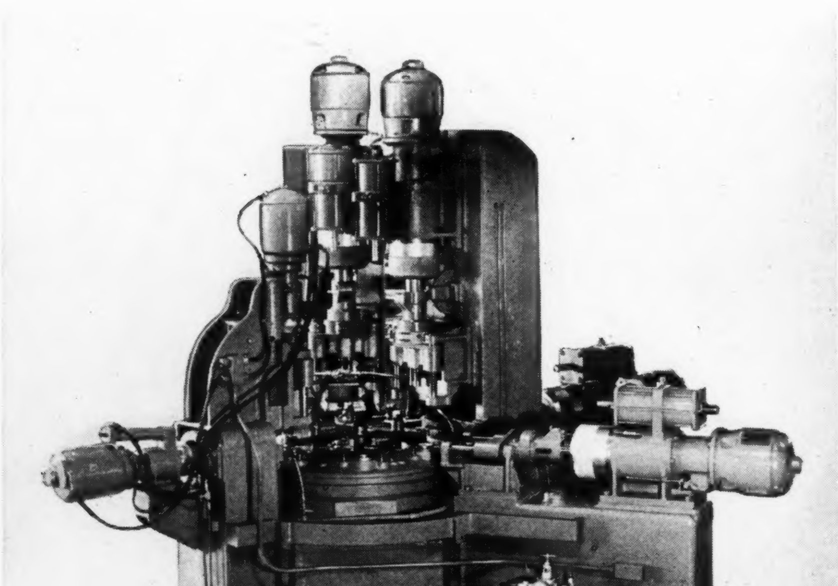


Fig. 2. Rear view of "Clipper" automatic lathe, showing automatic back-facing attachment, coolant pump and tank, and spindle clutch operating solenoid

Drill Units with Air-Hydraulic Control

The Cleveland Republic Tool Corporation, Cleveland 5, Ohio, has brought out a new No. 5 model drill unit, powered by the same air-hydraulic system used in the smaller models built by the company for drilling, centering, countersinking, facing, and milling operations. The air-hydraulic system incorporates a sealed unit construction that permits operation in any position. The design readily conforms to the practice of grouping single units on simple welded bases rather than building complete special machines. Thus any grouping can easily be changed to meet changes in design of the work-piece. Four standard bases are provided, so that it is only necessary to change the holding fixtures when shifting over for the production of a new part.



Machine with new air-hydraulic control units built by the Cleveland Republic Tool Corporation

Drill spindle thrust is provided by the regular air system of the plant or an auxiliary supply. The arrangement provides for rapid advance to an accurate positive stop, a metered hydraulic feed to another positive stop, and rapid return. The rapid advance travel is accurate to within 0.005 inch, and the feed will hold the final depth to an accuracy of 0.001 inch.

The new Model 5 is the largest drill unit yet made by the company. It is available with motors of 2 to 5 H.P., and has a maximum stroke of 6 inches. The spindle is normally furnished with a No. 4 Morse internal taper, and the quill is adaptable to multiple-spindle drill heads. These drill units are extremely simple in design, since there are only three moving parts, in addition to the spindle. 67

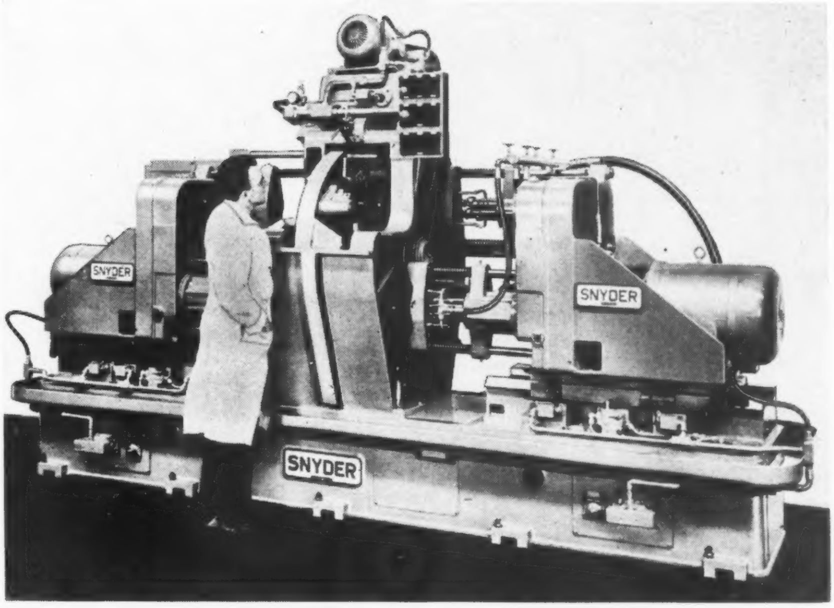
To obtain additional information on equipment described on this page, see lower part of page 208.

Snyder Automatic for Machining Automotive Transmission Parts

A new automatic machine for drilling, countersinking, rough-boring, and semi-finish-reaming six holes in automotive transmission parts has been developed by the Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. The transmission planet carrier and parking lock gear assembly machined on this automatic is located and clamped in special air-operated diaphragm type chucks. A hydraulically operated pressure plate is provided at the drilling station to support the part and chuck against the drilling pressure.

The machine is equipped with a four-station member on which the work-holding chucks are mounted, which is indexed by a Geneva motion mechanism. The tools used are of high-speed steel and run at a cutting speed of 70 surface feet per minute. A 10-H.P. motor drives the right-hand head, and a 5-H.P. motor the left-hand head. A 2-H.P. motor serves to drive the Geneva indexing mechanism.

The hydraulic operating fluid and the cutting coolant are housed in separate tanks at the rear of the machine, which is of welded steel construction. The machine requires a floor space of 81 by 174 inches, and operates at a production rate of 75 cycles an hour at 80 per cent efficiency. The complete work cycle is automatic, and the machine can be run by unskilled operators. 68



Snyder automatic machine designed for drilling, countersinking, rough-boring and semi-finish-reaming automotive parts

Pratt & Whitney "Diaform" Wheel-Forming Attachment

Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., has just announced the development of a new wheel-forming attachment designated the "Diaform." This portable, relatively inexpensive wheel-forming device using templets 3/32 inch thick, made to an enlarged scale of 10 to 1, will form-dress wheels by means of a dressing diamond within accuracy limits of 0.0001 inch. It operates on the pantograph principle with sufficient rapidity to permit the wheel-dressing operation for a complex form to be completed in a matter of minutes.

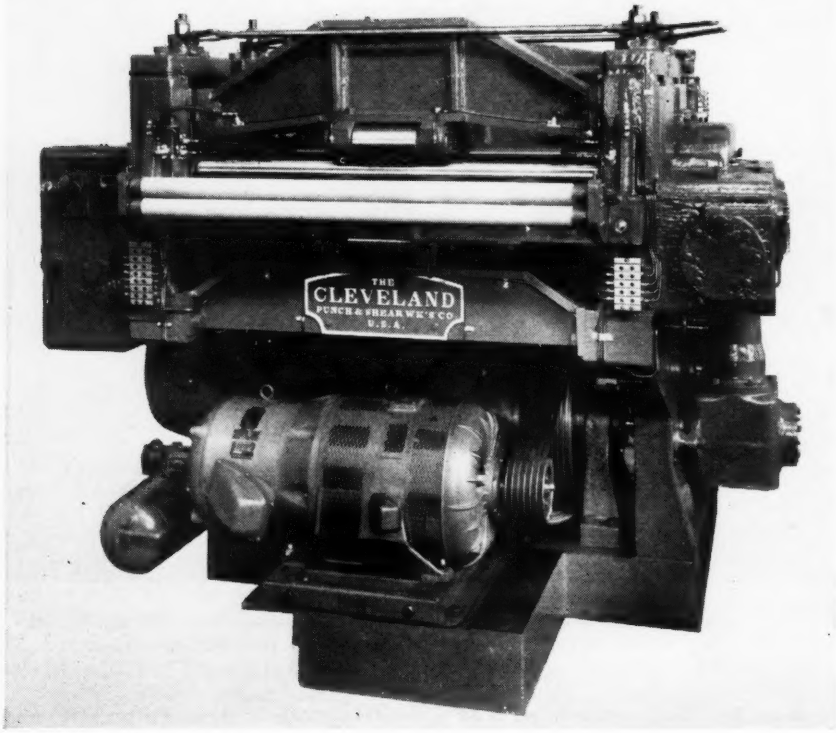
The attachment can be used on any horizontal surface grinder, and will consistently produce wheel forms of the required accuracy provided the machine spindle and its bearings are kept in good condition. It will form-dress to a depth of 1/2 inch on wheels up to 10 inches in diameter and 1 inch in width. For forms wider than 1 inch, increments of the profile are ground successively, the wheel being dressed to the required form for each increment and the work advanced the correct amount after each grinding and redressing operation until the complete profile has been ground.

The quick, precise method of


"Diaform" wheel-forming attachment brought out by Pratt & Whitney Division Niles-Bement-Pond Company

To obtain additional information on equipment described on this page, see lower part of page 208.

Cleveland Automatic Shear and Roll Feed



Automatic shear and roll feed for sheet metal built by the Cleveland Punch & Shear Works Co.

form-dressing grinding wheels provided by this attachment is especially adapted for use in the production of accurate split or segment dies, punches, and flat forming tools from solid hardened steel. The attachment weighs 35 pounds. Complete standard equipment includes a storage cabinet and accessories comprising rough, finish, and fine dressing diamonds, tracer points, gages, etc. 69

A 48-inch automatic shear and roll feed has just been added to the line of sheet-metal working equipment built by the Cleveland Punch & Shear Works Co., Cleveland 14, Ohio. The shear is equipped with an electrically controlled positive jaw clutch, and operates at a speed of 60 strokes per minute. Owing to the time delay in feeding stock, however, the number of cuts per minute depends on the length of stock fed into the shear. The machine will cut sheet steel 48 inches wide by 1/16 inch thick having a hardness of Rockwell 90 B.

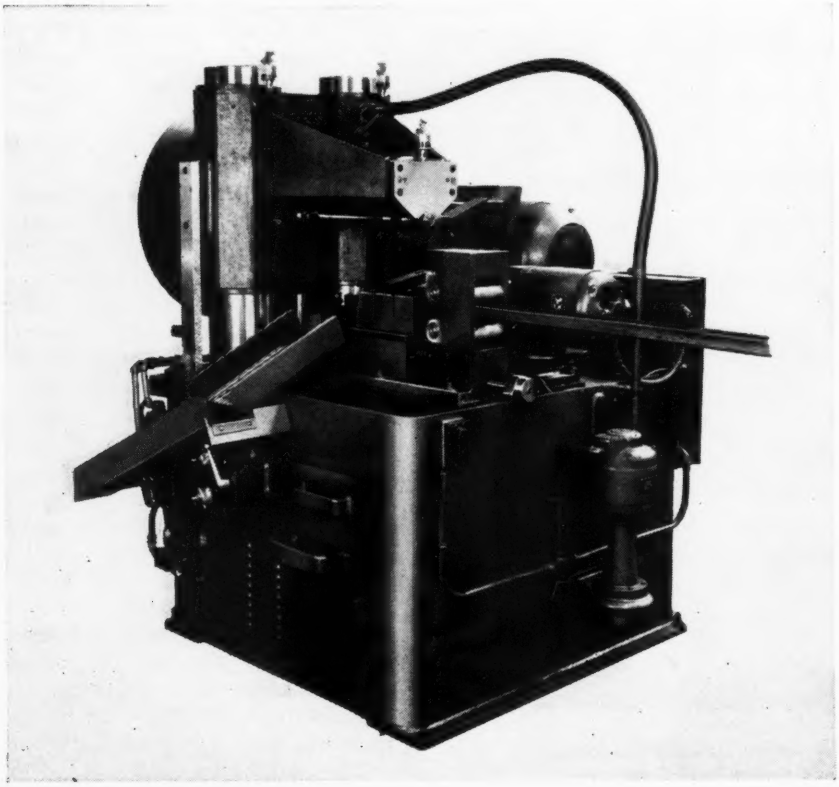
The roll feed consists of five straightening rolls and two sets of pinch rolls, arranged with an electrically controlled Cleveland patented drum type clutch.

The maximum length of feed on this particular machine is approximately 120 inches and the minimum length about 6 inches at an operating speed of about 200 feet per minute. However, provision can be made for a greater maximum length of feed. 70

Kent-Owens Milling Machine with Automatic Bar Feed

An automatic bar-feed machine for cutting-off or multi-milling operations has been designed and built by the Kent-Owens Machine Co., Toledo 10, Ohio. The head of the machine which carries the cutter travels in a downward direction until the cutter approaches the part to be milled or cut off. At this point, the cutting feed of the head is automatically engaged. The feed continues until the operation is completed, following which the feed reverses and the head returns by rapid traverse to the starting position.

During the return movement of the head, the finished part is automatically ejected and the bar is moved into place for the next cutting-off or milling operation. The machine operates continuously until the bar is cut into pieces of the required length or until the milling operations on the pieces have been completed. 71



Milling machine with automatic bar feed brought out by the Kent-Owens Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 208.

B. & S. Automatic-Cycle Spark-Timing and Sizing Equipment

Two new automatic-cycle arrangements have been developed by the Brown & Sharpe Mfg. Co., Providence 1, R. I., for use on its line of plain grinding machines. This new equipment is built to reduce idle machine time, require less attention of the operator, reduce spoiled work to a minimum, and thus serve to lower grinding costs.

An outstanding feature of the two developments is the method of bringing the grinding wheel into direct contact with the work while the device is in operation. This permits wider tolerances to be used on preceding turning operations, and provides for practically continuous full-time grinding. The conversion of a machine fitted with either one of the new automatic arrangements to a standard machine for short-run lots can be accomplished instantly.

The automatic-cycle and spark-timing arrangements shown installed on the B. & S. No. 22 plain grinding machine in Fig. 1 are designed to assure rapid, uniform sizing and finishing with the spark time set at a predetermined figure within the range of 2 to 180 seconds. When the grinding operation is completed, the wheel-slide withdraws automatically, the headstock stops, and the coolant flow is shut off. The work is sized by the accurate cross-feed mechanism of the machine, wheel wear from grinding and truing being compensated for in the usual way.

After loading the work into the machine, the operator gives it a single oscillatory movement by means of the cross-feed handwheel, bringing the grinding wheel into direct contact with the work. He then engages the pawl, causing the grinding cycle to be completed automatically, without further attention.

The new automatic-cycle and sizing equipment applied to the B. & S. No. 10 plain grinding machine, as shown in Fig. 2, further reduces the operating effort and skill required for accurate production grinding, as it sizes directly from the work, eliminating the necessity of compensating for wheel wear and wheel truing. After loading the work into the machine, it is only necessary to give the cross-feed handwheel a single oscillatory movement and place the sizing gage on the work. The grinding cycle is then completed automatically.

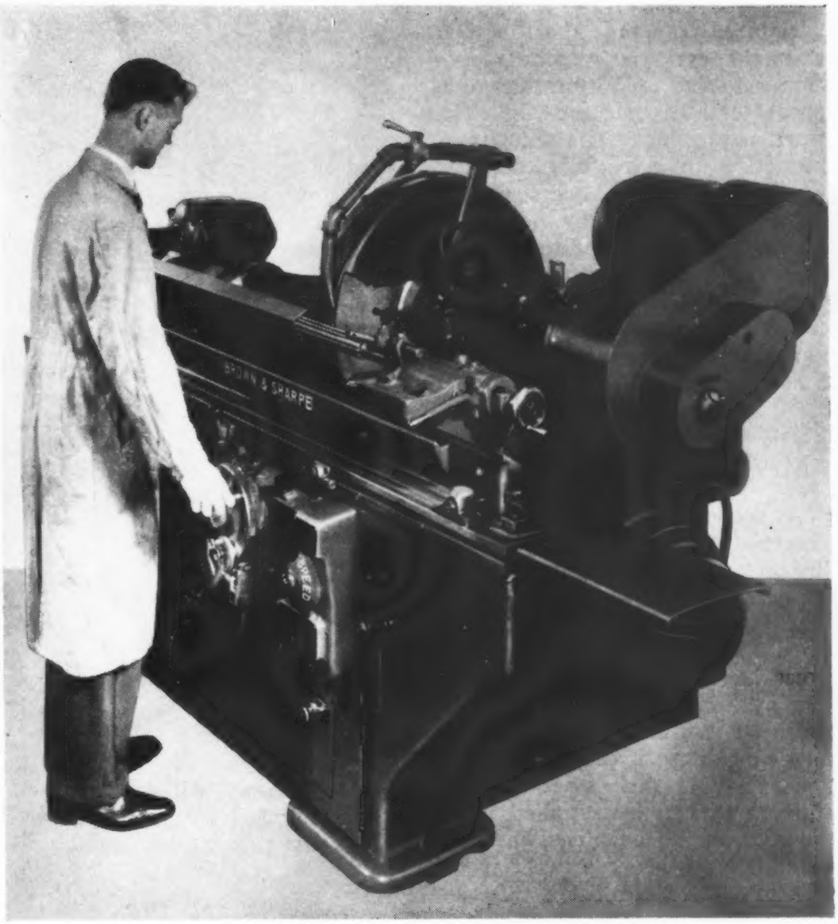


Fig. 1. B. & S. No. 22 plain grinding machine equipped with automatic-cycle and spark-timing arrangement

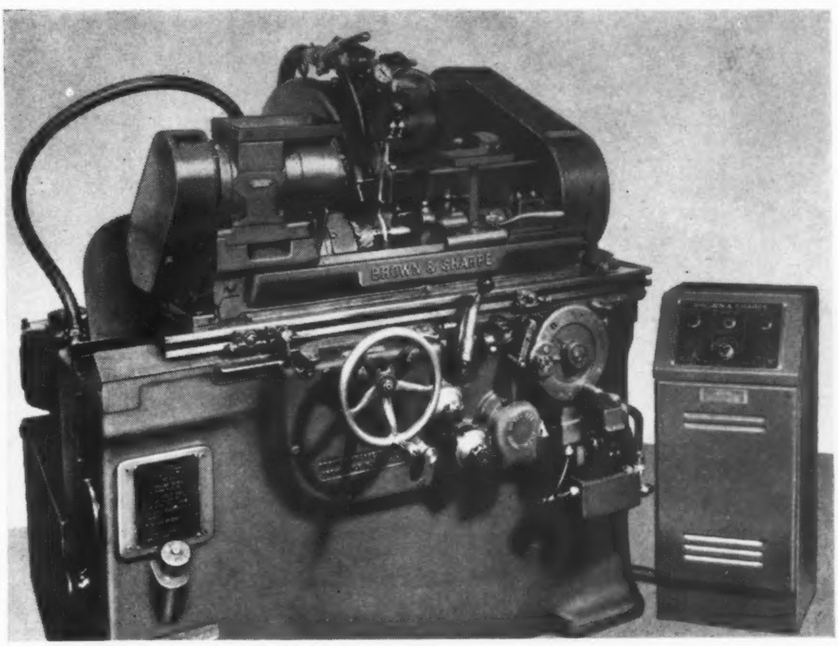


Fig. 2. B. & S. No. 10 plain grinding machine with automatic-cycle and sizing equipment

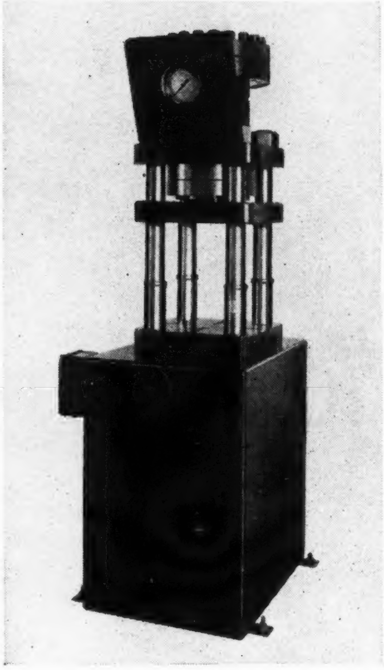
To obtain additional information on equipment described on this page, see lower part of page 208.

Before reaching the finished size, the cycle is switched from coarse to fine feed by means of a predetermined setting of the work-sizing gage. The amount of reduction in work diameter per revolution of the headstock can be readily selected by adjusting knobs on the front of the control cabinet. The indicating lights on the front of the panel facilitate setting up, thus simplifying the gage setting in conjunction with a master. 72

M & N Drawing Press

A self-contained 50-ton press designed for the accurate drawing and forming of metals is now being produced by the M & N Machine Tool Works, Inc., Allwood, Clifton, N. J. This new press has a 12- by 12-inch opening, a 10-inch stroke, an advance speed of 120 inches per minute, and a pressing speed, under full load, of 7 1/2 inches per minute. This press can be supplied with air or hydraulic cushions, and can be built on order to a capacity of 200 tons.

The press is 6 feet high, occupies an area of 24 by 30 inches, and weighs 1600 pounds. The dual pressure pump is contained in the base. The large dial can be easily tilted forward for accurate pressure readings. All controls are easily operated for precision control of the press. 73



M & N drawing and forming press

Adjustable Flange Punch Tools

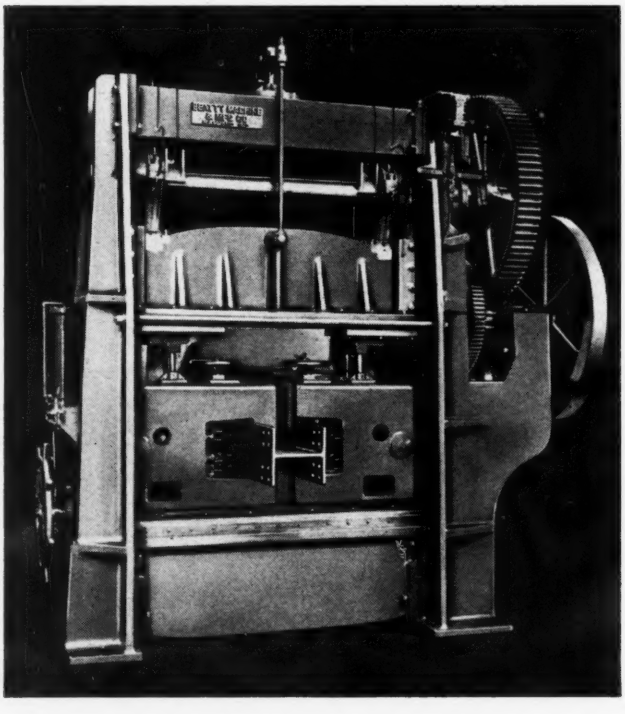
An adjustable set of punch tools designed to punch all four flanges of I-beams and wide-flange beams at one pass has been announced by the Beatty Machine & Mfg. Co., Hammond, Ind. These tools are intended for use in large structural steel shops on Beatty guillotine punch presses.

The new tools include a punch carrying unit, which can be adjusted horizontally from 8 to 30 inches to accommodate beams of various sizes. The punch and die units can be adjusted vertically to meet gage line requirements. 74

Quijada Pipe-Threading Machine

A new "Thread-O-Matic 44" pipe-threading machine with a capacity for threading pipe in sizes from 1/2 inch to 4 inches has been brought out by the Quijada Tool Co., 5474 Alhambra Ave., Los Angeles 32, Calif. This machine has been developed to meet the demand for faster working speeds, automatic chucking, higher quality threads, and reduction in maintenance expense, combined with lower initial cost.

Features include cutter mounted on front housing plate to allow operator to place a fitting on the pipe immediately after threading; pump arranged to provide instantaneous flow of oil to exact spot needed in each die-head; easy gear shifting to permit selec-



Beatty press with tool equipment for punching all four flanges of I-beams

"Thread-O-Matic" pipe-threading machine brought out by the Quijada Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 208.

tion of proper spindle speed within a range of 17 1/2 to 118 R.P.M.; large red blinker light which flashes every two revolutions, permitting operator to start thread on first flash, count five flashes and then open die-head to obtain thread of exactly the correct length; quick-opening die-heads which can be rapidly interchanged from one size to another; four high-speed dies for each head, which can be adjusted simultaneously by one screw to change depth of thread; flat-blade reamer attached to each head, which reams while threading or can be removed to permit cutting running threads; 3-H.P., 220-volt, three-phase, 50- to 60-cycle motor with automatic magnetic switch for overload protection; and carriage with 16 1/2-inch maximum travel.

The machine is 45 1/2 inches long, 20 inches wide, 49 inches high, and weighs 968 pounds.....75

Improved "Benchmaster" Milling Machine

The bench milling machine built by Benchmaster Mfg. Co., 2952 West Pico Blvd., Los Angeles 6, Calif., which is so designed that it can be used interchangeably as a horizontal or a vertical machine by substituting spindle assemblies, has recently been improved by the addition of a telescopic vertical elevating screw operated by large steel miter gears. The telescopic screw permits the machine to be used on any bench or stand without drilling these members to permit the screw to be extended below their supporting surfaces. The miter gears which operate the telescopic sections are designed to assure greater smoothness and ease of operation in making vertical adjustments.

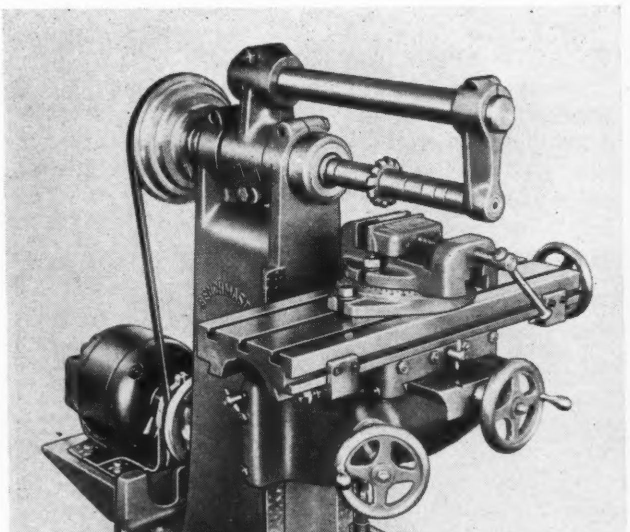
The new machine has a 6- by 18-inch table, with a longitudinal travel of 12 1/2 inches, a transverse feed of 5 1/2 inches, and a vertical travel of 8 1/2 inches. Timken tapered roller spindle bearings of high load capacity adapt the machine for both low- and high-speed operation. Attachments are available which adapt the "Benchmaster" for turning, grinding, and drilling. 76

Peerless "Threadfast" Machine with "Roto-Lok" Wrenchless Chuck

A triple-purpose portable machine designed for cutting, reaming, and threading pipes and threading solid rounds has been placed on the market by the Peerless Machine Co., 1600 Junction Ave., Racine, Wis. The new "Roto-Lok" wrenchless chuck permits rapid chucking and releasing of the work while the spindle is rotating. Pipes, solid rounds, and bolts can be quickly centered and rigidly held.

Pipe having diameters of 1/8 inch to 2 inches and bolts with diameters of 3/8 inch to 1 1/2 inches can be passed through the rear centering unit of the chuck. A simple adjustment of the rear centering unit provides support for one end of the pipe. Turning the handwheel of the chuck serves to center the other end and lock the pipe in position.

A gear-operated vane type pump carries the oil from the reservoir to the die-head. The drive is through a special high-speed universal gear type motor that automatically adapts its speed to the size pipe and type of thread being cut. All die-heads used on the machine are free floating units. They can be opened quickly for rapid removal of stock by means of a hand-operated



Improved milling machine brought out by the Benchmaster Mfg. Co.

"Threadfast" machine with wrenchless chuck built by Peerless Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 208.

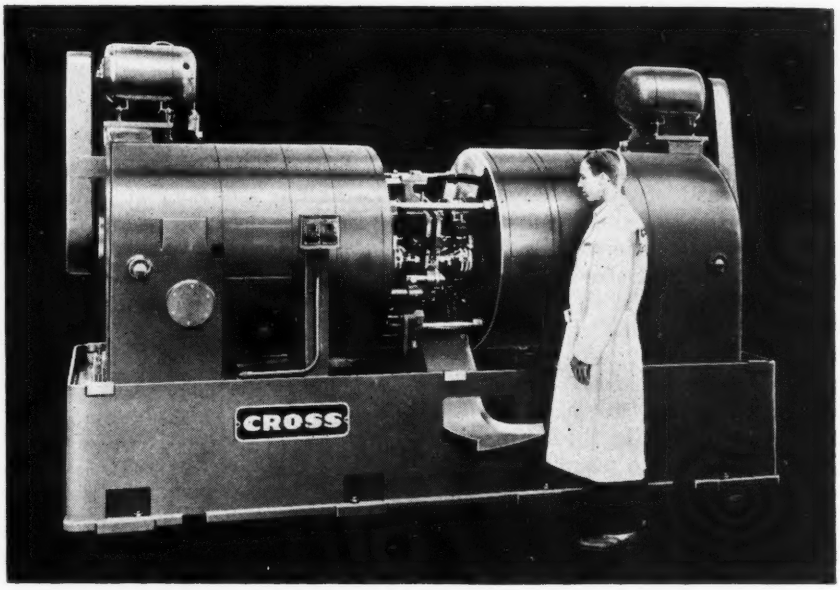
toggle clamp. The chasers are of high-speed steel, and can be easily reground when dull. Single chasers are replaceable should they become broken or worn. 77

Gopher Tool Grinder

The Gopher Machine & Engineering Co., 3333 University Ave., S.E., Minneapolis 14, Minn., has brought out a tool grinder designed to grind all automatic screw machine and turret lathe tools, as well as ordinary lathe tool bits. This Model A grinder is built to attain precision sharpness of all makes of chasers, circular form tools, dovetail tools, block tools, tool bits, and other metal-cutting tools.

Ease and simplicity of set-up is said to enable operators with minimum skill to sharpen any tool accurately. Changes from one fixture to another, and from one set-up to another, can be accomplished in one or two minutes. Work-holding fixtures are so designed that each cutting tool is held for the grinding operation in exactly the same manner as it is held in the die-head or tool-holder when performing cutting operations.

The spindle has special precision ball bearings, and is driven by V-belt from a 1/4-H.P. motor. Standard equipment includes one 3 1/4- by 1 1/4- by 1/2-inch flared cup-wheel; one 5- by 1/2- by 1/2-inch straight wheel; a universal vise; a diamond dresser; and a driving motor having a rating of 1/4 H.P. 78



Cross special automatic machine for chamfering connecting-rods

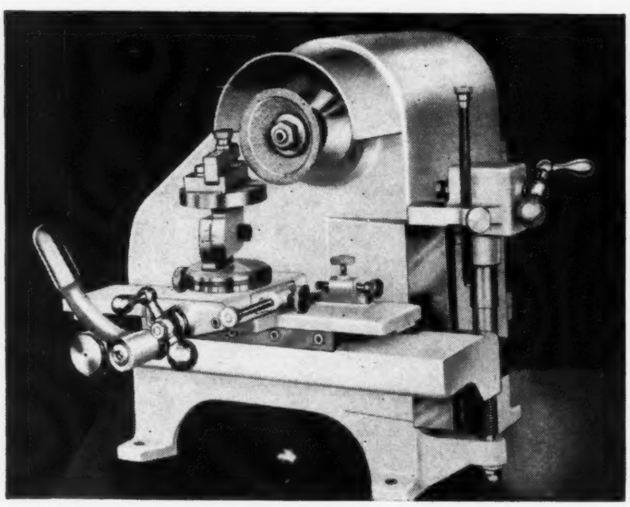
Cross Connecting-Rod Chamfering Machine

Connecting-rods can be chamfered at the rate of 1000 per hour on a special automatic machine tool recently built by The Cross Company, Detroit 7, Mich. The operator merely loads the parts into the machine and presses the cycle button. Unloading of the work on the conveyor and clearing of the machine for the next operation are done automatically.

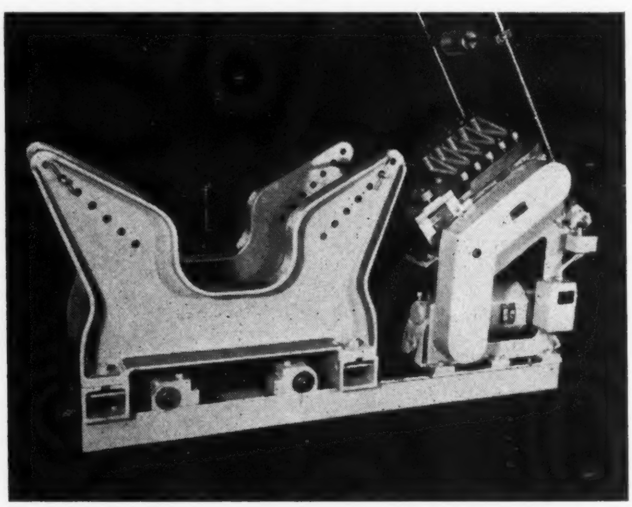
The tool-heads are designed to align the work from the main bore, in order to insure the maintenance of concentricity within close limits. Single-point carbide tools are used for the chamfering operations. Other features include complete cam operation and safety clutches for protection against improper loading and off-size parts. 79

Power-Driven Stock Straightener and Coil Cradle

The U. S. Tool Company, Inc., Ampere (East Orange), N. J., has recently added a combination power-driven stock straightener and coil cradle to its line of press-room equipment. This Model PDSC-1240 unit will handle material up to 12 inches wide and 1/8 inch thick in coils having outside diameters up to 40 inches. The



Tool grinder brought out by the Gopher Machine & Engineering Co.



Power-driven stock straightener and coil cradle made by U. S. Tool Company

To obtain additional information on equipment described on this page, see lower part of page 208.

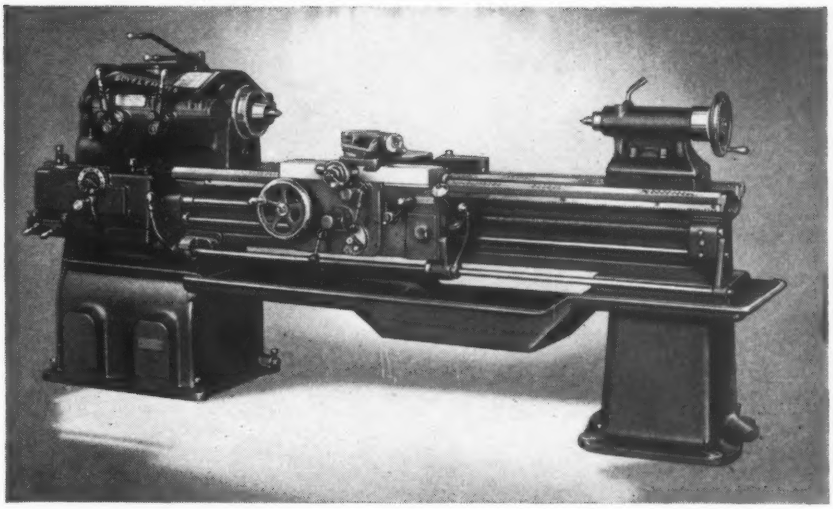
maximum thickness that can be satisfactorily straightened depends, of course, upon the type and temper of the material.

The unit has a pair of power-driven hardened and ground feed-in rolls, and ten straightening rolls, the lower five of which are also power-driven. Included with the unit is a mercury switch control and 1 1/2-H.P. driving motors. 80

"Super-Soak" Metal-Parts Washing Machine

An automatic "Super - Soak" metal-parts washer using the old "dunking" method with an active soak and wash action has been placed on the market by the Super-Soak Co., 1441 S. 65th St., West Allis 14, Wis. The motions imparted to the work-holding tray cause a swishing and positive cleaning action, which serves to loosen and then remove the grease, dirt, or other foreign matter from the work. The sludge at the bottom of the cleaning tank is undisturbed, since the work tray descends within only 3 inches of the bottom of the tank. The parts to be cleaned are placed on the tray above the solution level, after which the cover is closed and the motor started. After the parts have been cleaned, the motor is stopped and the tray automatically raised above the solution.

The washer is made in four sizes, the largest size being 60 by 30 by 30 inches, with a work tray of 57 by 28 inches. 81



Improved 16-inch lathe announced by Boye & Emmes Machine Tool Co.

Boye & Emmes Improved Lathe

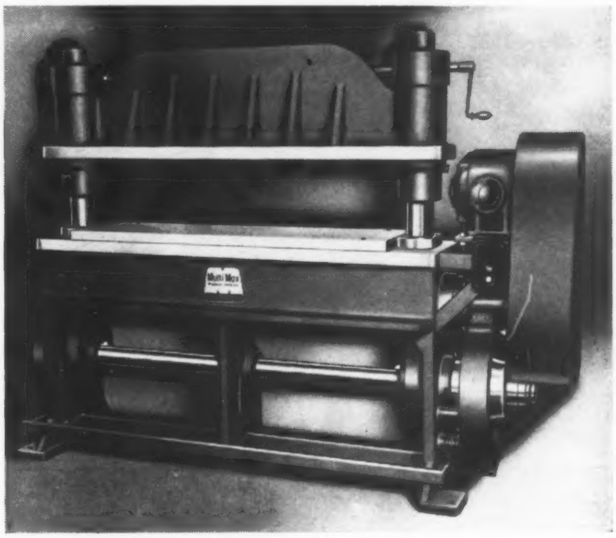
An improved 16-inch lathe built to operate at spindle speeds up to 1080 R.P.M. has been announced by the Boye & Emmes Machine Tool Co., 125 Caldwell Drive, Hartwell, Cincinnati 15, Ohio. This press is equipped with a new anti-friction gear-box which provides sixty-three changes of feed or lead for thread cutting, including 11 1/2 and 27 threads per inch. All gears are heat-treated alloy steel with shaved teeth.

Other features include a graduated tailstock spindle milled for drill tang; one-shot lubrication for gear-box and quadrant; anti-friction bearing lead-screw box; direct-reading dials; and chrome-plated handwheels. 82

Diamond "Multi-Max" Punch Press

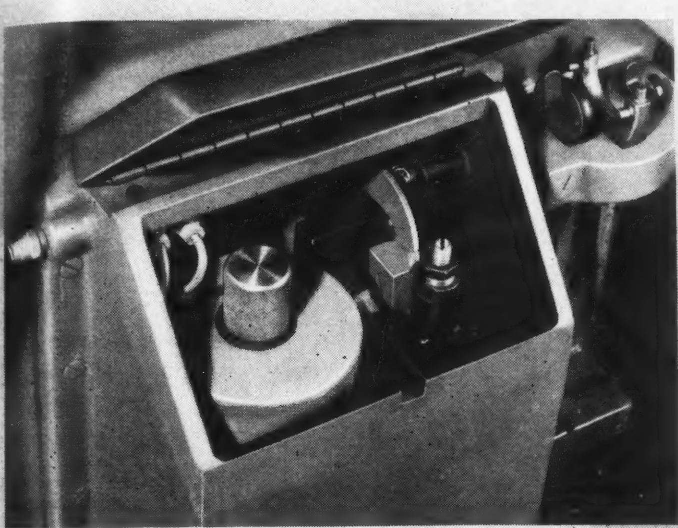
A new "Multi - Max" punch press is being manufactured by the Diamond Machine Tool Co., 3421 E. Olympic Blvd., Los Angeles 23, Calif. This press is rated at 30 tons capacity, and has a large bolster area of 16 by 48 inches, combined with a ram area of 10 by 48 1/2 inches, which makes possible the economical handling of a wide variety of metal - stamping operations, including blanking, piercing, notching, bending, shearing, and draw-

Rear view of metal-parts washing machine made by Super-Soak Co.



"Multi-Max" punch press manufactured by the Diamond Machine Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 208.



AUTOMATIC LUBRICATION !

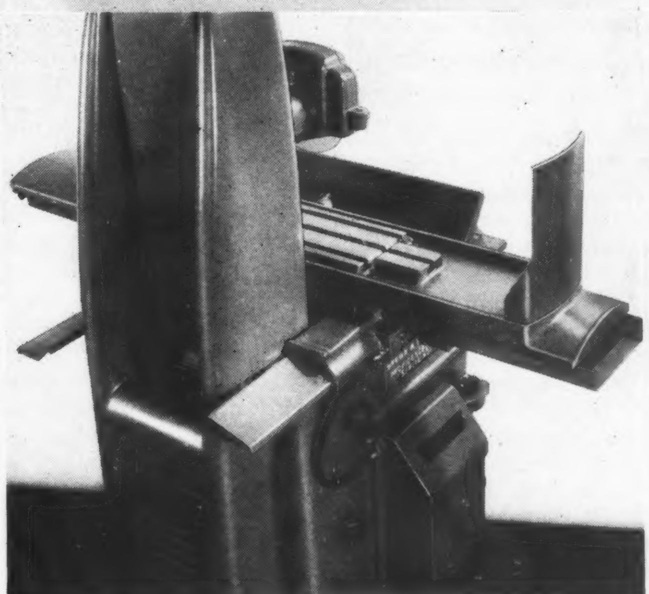
Lubrication of the 2L and 2LB is never a chore or a worry. All moving parts and adjustable surfaces automatically lubricated by plunger pump from reservoir on left side of base. Convenient sight indicator on right side of upright shows operation of oiling system. Oil is filtered before being returned to reservoir.

AUTOMATIC LUBRICATION. Pump and filter are located in compartment on left side of machine.

DUST PROOFED !

Extra precaution has been taken to protect these machines from dust and dirt. Table ways are completely guarded. Saddle and upright ways are similarly protected. Elevating mechanism completely enclosed.

WRITE FOR DESCRIPTIVE BULLETIN . . . illustrating both the 2L (with power feeds) and the 2LB (with hand feeds only). Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



DUST PROOF COVER GUARDS. Table and saddle ways are fully protected against abrasive dust.

. . . TYPICAL PROVEN FEATURES INCLUDE

- Removable unit-type precision wheel spindle; plain or antifriction bearing type; interchangeable.
- Alternate choice of spindle drive; with motor in base; with motorized spindle.
- All controls and adjustments conveniently located. Electrical controls enclosed in separate housing.
- Versatile. Several money-saving attachments.

SHARPE

BS

ing. It is also adaptable for such applications as cutting felt and fiber material with the use of steel-rule dies.

The press is of all-steel welded construction with a four-point engaging clutch. The standard stroke is 2 inches, and the maximum stroke available on special order is 4 inches. Operation is at a speed of 80 strokes per minute. Standard shut die height is 10 inches, but the press can be made to order for any desired shut die height up to 70 inches. The ram adjustment is 2 inches.

Precision herringbone gearing provides quiet, accurate operation. The crankshaft is 3 inches in diameter, and is heat-treated, ground, and highly polished. A 3-H.P., 1800-R.P.M. motor is recommended for the drive. The weight of the machine is 4150 pounds. 83

New Air-Hydraulic Milling Machine

The United States Machine Tool Co., Division of the U. S.-Burke Milling Machine Co., Cincinnati 16, Ohio, is introducing on the market a newly developed air-hydraulic feed milling machine for high-speed semi-automatic production. The table has a power longitudinal travel of 18 inches. Other features are table speed adjustable in both directions; cutting speed infinitely adjustable; and compact design requiring a minimum of floor space.

The automatic pneumatic table feed provides rapid approach, adjustable feed, and rapid return movements. An extremely smooth cut is said to be achieved by having the air cylinder operate against the hydro check-valve. 84

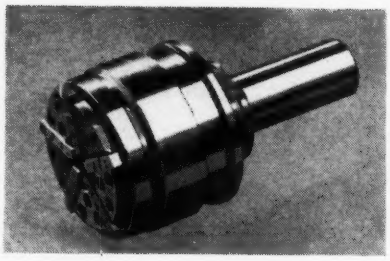


Fig. 1. Geometric five-chaser rotary self-opening die-head

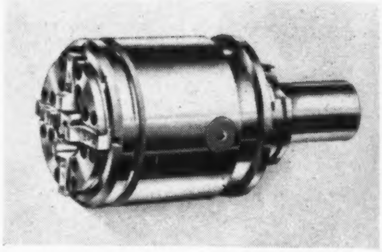


Fig. 2. Geometric rotary taper die-head

Black Improved Nail-Making Machine

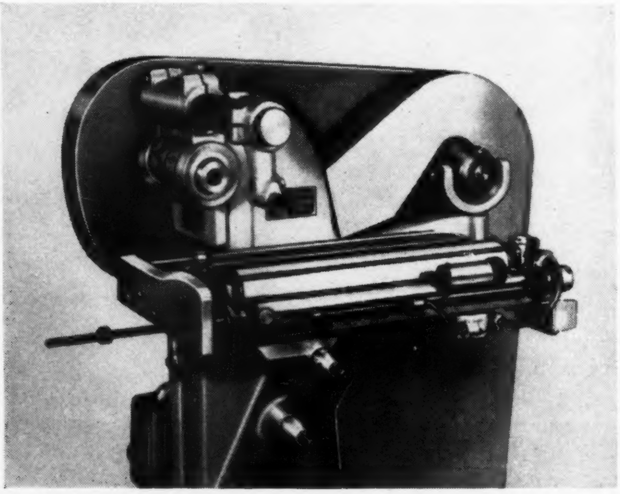
Black Industries, 1400 E. 222nd St., Cleveland 17, Ohio, are now in production on a new Model GB wire-nail making machine primarily intended for producing all commonly used sizes of large-head roofing nails. This machine also has a capacity for making other styles of nails up to 3 1/2 inches long. It takes the place of the Models GA and EA machines.

Basically, the new machine operates on the same principle as the GA model, but the design has been changed, the weight being considerably reduced without sacrificing strength in the crankshaft member. Other changes in design provide for an increase in the area that is pressure oil lubricated and the placing of controls and adjustments for easier access by the operator, so that set-up and maintenance costs are materially reduced. 85

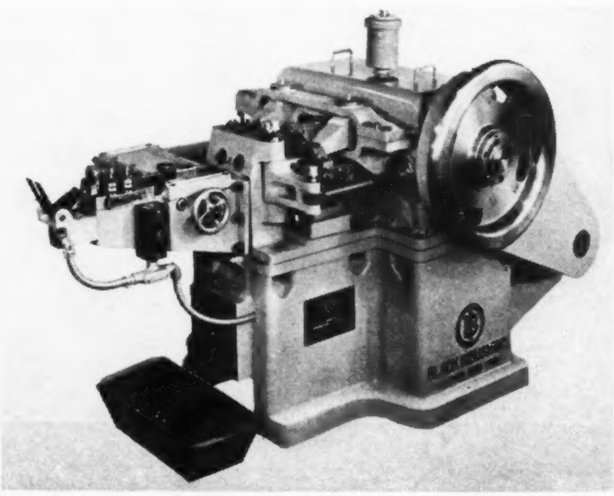
Geometric Die-Heads

The Geometric Tool Co., Division of Greenfield Tap & Die Corporation, New Haven 15, Conn., has brought out two new die-heads—the five-chaser Style KDS rotary die-head shown in Fig. 1, and the rotary taper die-head shown in Fig. 2. The five-chaser rotary die-head, through the intermittent cutting action of the uneven number of chasers, makes possible improved threading of square, flat, and irregular-shaped stock. It is especially adapted for threading such parts as square door-knob spindles in which the cut is interrupted. This die-head can be applied to automatic machines, drill presses, etc., in which the die-head rotates. It has all the advantages of the four-chaser Style KD head, including positive tripping and resetting by means of a fork operating on the die-head trip flange, and is made in 1/2- and 7/8-inch sizes.

The rotary taper die-head is made in three styles—a Style KT for regular taper pipe threads, a Style KTR for reverse taper threads, and a Style KTI for

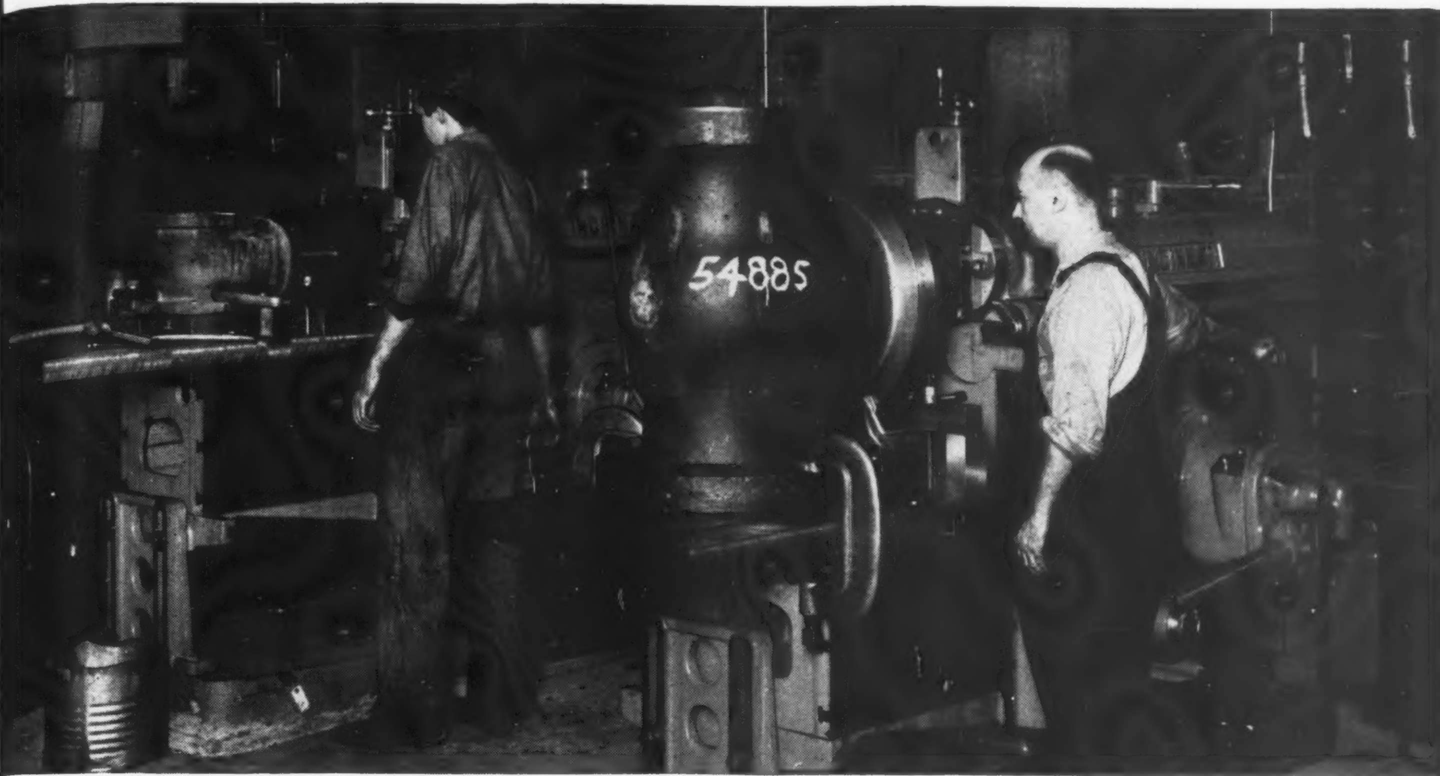


Air-hydraulic milling machine built by United States Machine Tool Co.



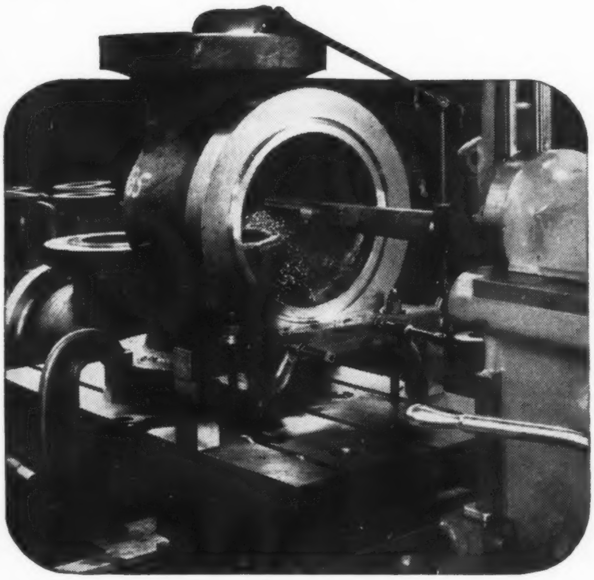
Improved design of nail-making machine brought out by Black Industries

To obtain additional information on equipment described on this page, see lower part of page 208.



Photos—Courtesy William Powell Co., Cincinnati, Ohio

Internal Shaping . . .



Here is a 32" Cincinnati shaping the guides on a 10" class 600-lb. flanged end gate valve body. Cut length is 16"; feed, .010".

SOLVED THE PROBLEM Internal shaping is the answer to a long list of "hard-to-get-at jobs." The illustration shows two Cincinnati Shapers of a battery of ten machines shaping both male and female valve guides at the William Powell Company.

MANY SIZES Valves ranging from small 8"—150 lbs. pressure to 30"—2500 lbs. pressure, weighing well over 1000 lbs., are rapidly and efficiently handled.

SIMPLE TOOLING Extension tool holder and high-speed bits cost relatively little. Cincinnati supplementary tables permit rapid setups for the larger valves. Low-cost operation is combined with a high production efficiency.

Write for Shaper Catalog N-4 for complete description of Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

straight threads. Conversion from one style to another is easily effected by simply changing two parts. Each of the three styles is made in 9/16-, 1-, and 1 1/2-inch sizes. 86

Di-Acro Power-Operated Shear

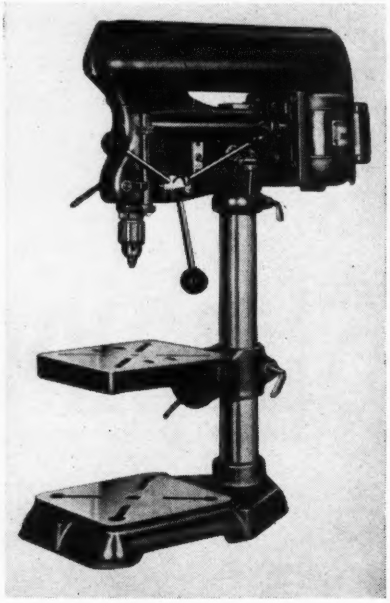
The O'Neil-Irwin Mfg. Co., 332 Eighth Ave., Lake City, Minn., has just announced a new Di-Acro power-operated shear designed for close-tolerance and high-speed production shearing of a great variety of materials, including metals, plastics, and other non-metallic materials from the lightest to the heaviest gages.

The ease with which this machine can be operated makes it especially adaptable for use by women operators. A protractor gage for squaring and mitering operations, which can be quickly and accurately adjusted for any degree of angularity, is supplied.

The precision length gages can be mounted either in front of the shear blade for accurate trimming of parts or in back of the blade for precision sizing of stock. A steel cabinet houses the motor and controls. The power shear is operated by a non-repeating positive action safety clutch controlled by either a foot-bar or hand-lever. The combination blade guard and adjustable hold-down bar insures safe, high-speed operation.

The shear is made in two sizes, the smaller machine having a maximum shearing width of 12 inches, while the larger has a maximum shearing width of 24 inches. Both machines have a maximum capacity for shearing 16-gage sheet steel. The flywheel operates at a speed of 200 R.P.M. The smaller machine is driven by a 1/3-H.P. motor, and the larger machine by a 1/2-H.P. motor. The smaller machine requires a floor space of 18 1/2 by 30 inches, and the larger machine a space of 18 1/2 by 40 inches. The weights of the two sizes are 450 and 650 pounds. 87

Di-Acro power-operated shear built by the O'Neil-Irwin Mfg. Co.

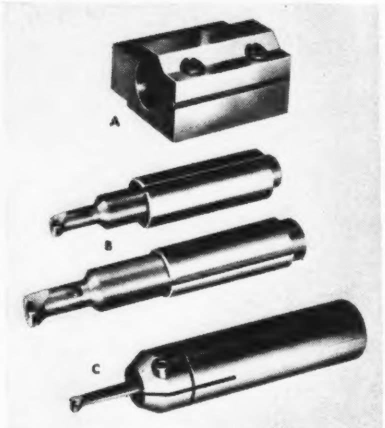


Drill press announced by Famco Machine Co.

Famco Drill Presses

The Famco Machine Co., Racine, Wis., has recently added a 15-inch drill press to its line of machine tools. The new drill press series, consisting of seven models, includes bench and floor types in tilting table or one-, two-, three-, and four-spindle production designs. The chuck capacity ranges from No. 70 to 1/2 inch, with Jacobs chuck or No. 1 Morse taper optional.

The range of spindle speeds is from 625 to 4800 R.P.M. in standard models, and from 490 to 3000 R.P.M. on "Slo-Speed" models. With the Famco speed-reducing attachment, spindle speeds as low as 185 R.P.M. can be obtained. The speed-reducing attachment, together with belt guard and tapping attachment, is optional equipment. 88



Holder and single-point boring tools made by the Bokum Tool Co.

Bokum Single-Point Boring Tools and Holders

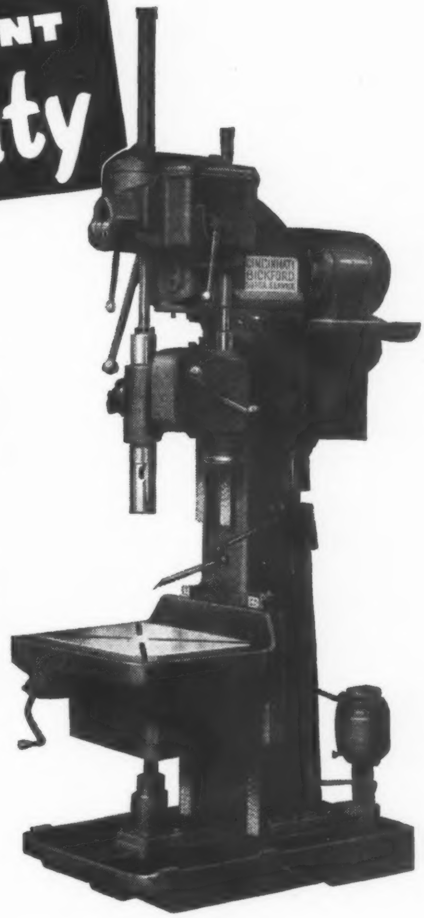
The Bokum Tool Co., 14775 Wildmere, Detroit 21, Mich., has brought out a holder, shown at *A* in the illustration, which is especially designed for holding Bokum single-point boring tools on lathes. This holder, together with newly developed shanks and adaptors, completes a line of tools covering a range of boring capacities from 1/16 inch to about 4 inches in diameter.

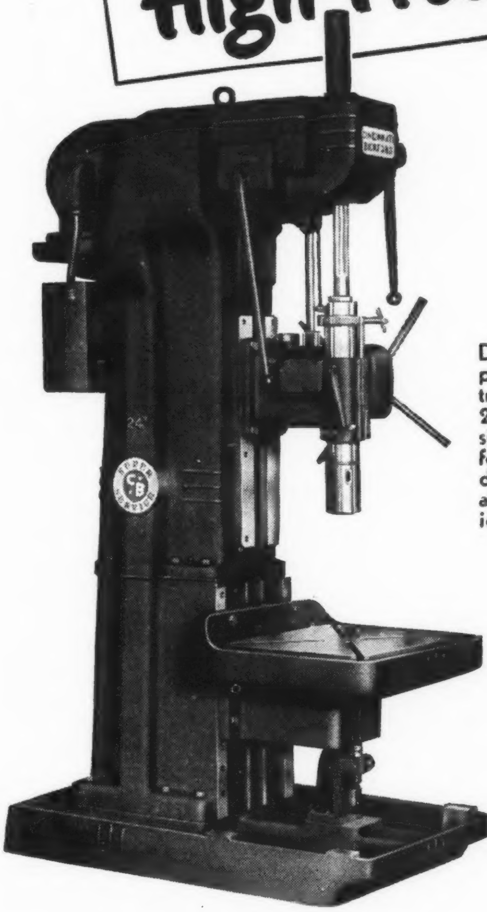
The new holder (BT-24) has a 1 1/2-inch bore. Split bushings, shown in the two central views *B*, have outside diameters of 1 1/2 inches and inside diameters of 1 inch and 1 1/4 inches. These bushings are intended for use with tools Nos. 4 to 12, which give a boring range of from 11/16 inch to 2 inches.

An adaptor (B-1244), shown at *C*, of 1 1/2 inches outside diameter, accommodates tools Nos. 00000 to 3, which have a 3/8-inch shank and will theoretically give a minimum diameter range of from 1/16 to 9/16 inch. Shanks of three different diameters with threaded ends are provided for attaching the separate cutter-heads Nos. 4 to 12. There are centers at each end of the shank to facilitate turning down the neck to any desired size for any practical length required, and at the same time, provide maximum rigidity.

For boring deep holes with a high degree of precision, the company has also developed a new line of single-point boring tools made of solid tungsten carbide. These tools are designed to obtain

To obtain additional information on equipment described on this page, see lower part of page 208.





the greatest possible rigidity. Other advantages include helical and spiral relief and constant clearance. They are made in two sections, the head consisting of a carbide having high wear-resisting qualities, while the shanks are made of a tough grade of carbide having maximum strength. The ten sizes comprising this line have shank diameters ranging from 3/32 to 1/2 inch; over-all lengths from 3 to 7 1/4 inches; and minimum boring diameters of from 0.115 to 0.600 inch. 89

Marvin Vertical Milling, Slotting, and Rotary-Table Attachments

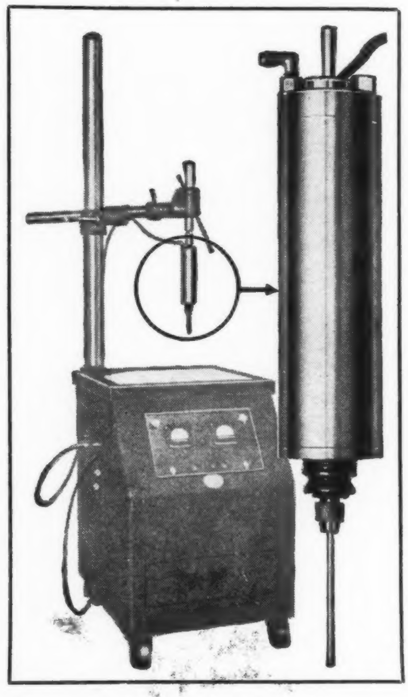
Marvin Machine Products, Inc., 414 Ford Bldg., Detroit 26, Mich., has just placed on the market a line of attachments for bench milling machines, which includes a

Milling machine attachments brought out by Marvin Machine Products

new vertical milling attachment, a slotting attachment, and a rotary table. The vertical milling attachment, Model V-1200, is driven from the bench mill spindle, and permits the automatic feeds of the machine to be employed. This attachment can be set at different angles and can be pulled out past the travel range of the regular table for machining large overhanging work. A wide variety of work can be handled. The spindle has Timken taper roller bearings, and takes end-mills with 3/8- to 1 1/2-inch straight shanks and up to 1/2 inch in diameter.

The slotting attachment, Model S1070, which requires no extra motor, can be attached to the bench mill spindle. It makes possible the production of dies, squared or splined holes, internal gears and many other shapes that cannot ordinarily be machined on the bench mill. The stroke is adjustable from 0 to 2 inches. The holder takes tools having a 1/2-inch shank. This attachment is 7 1/2 inches high and 4 1/4 inches wide.

The new rotary table, Model R-1102, is designed to meet the need for an extremely rigid table in the low-cost range. This table is properly proportioned for use on bench mills or shapers. It is graduated in degrees, and can be locked from the bottom to prevent tilting. The worm is hardened and ground, and has a 40 to 1 ratio. Three 3-inch index-plates and handwheels are furnished. The table is 6 inches in diameter and 2 5/8 inches high. 90



Thomas "Metal Master" disintegrator equipment manufactured by the Clinton Machine Co.

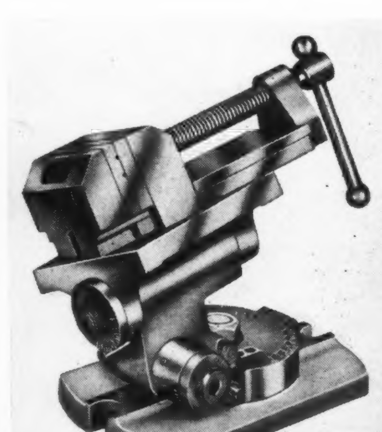
Thomas Improved "Metal Master" Disintegrator

Exceptional cutting speed, accuracy, long life, and economical operation are some of the advantages claimed for the new Thomas "Metal Master" disintegrator built by the Clinton Machine Co., Clinton, Mich. This disintegrator will remove broken taps 3/8 inch in diameter by 5/8 inch long in sixty seconds, and will cut a 0.155-inch hole through 1/4-inch Carboloy in five minutes, through 3/8-inch Stellite in forty seconds, and through 3/4-inch high-speed steel in sixty seconds. The collet on this disintegrator will take a 9-inch "Thomlium" electrode, which can be moved out as the cutting depth increases. This arrangement increases the rigidity of small-size electrodes, and makes possible an accuracy of from 0.003 to 0.005 inch.

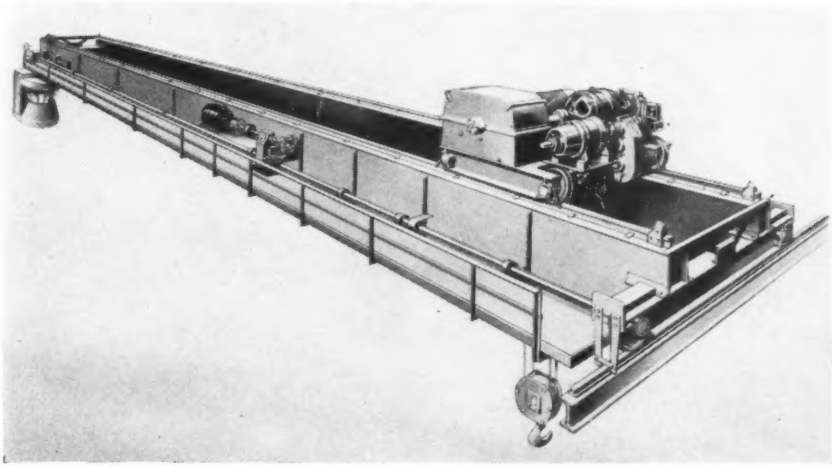
The disintegrator is adapted for cutting holes in hardened dies, and can be used for cutting keyways and oil-holes in hardened gears without annealing the metal. Other applications include such operations as cold-welding cast iron without causing cracks, arc welding, arc brazing and soldering, drill pulling, etching on metal for identification purposes, and demagnetizing parts. 91

Matco "All-Angle" Precision Vise

"All-Angle" precision vise with cradle having a tilting range of 45 degrees each side of the horizontal position. Available in sizes having jaws 3 1/2 and 4 1/2 inches wide. The base of this vise can be swiveled from the 180-degree vertical setting to 90 degrees. Designed for drilling, counterboring, tapping, and reaming operations. Universal attachments adapt this vise for use on a jig or fixture for production work. Fine angle settings are made by means of an adjusting screw. Placed on market by Matco Tool Co., 2830-36 W. Lake St., Chicago 12, Ill. 92



To obtain additional information on equipment described on this page, see lower part of page 208.

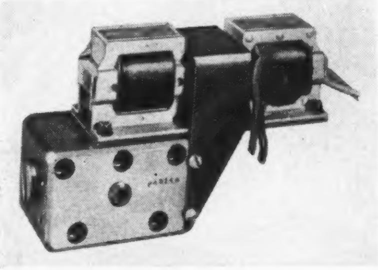


Whiting Electric Traveling Crane with Fluid Drive

Electric traveling crane featuring streamline, full-vision cab, simplified magnetic controllers, and fluid-drive hydraulic couplings on both bridge and trolley motors. The cab is designed to provide maximum ease and comfort for the operator, with the widest possible range of vision. By moving short finger-tip levers, the operator, while seated in a comfortable position, can easily control all crane motions. The magnetic controllers require only low voltage lines to the cab and eliminate the necessity for using cumbersome drum-type controllers, thus reducing maintenance and adding to the life of the motors. The fluid-drive hydraulic couplings are applied to both bridge and trolley drives of the crane. This permits the use of less expensive electric motors and results in faster pick-up and quicker braking. With the fluid drive, the motors can be reversed suddenly without harmful results. Announced by the Whiting Corporation, Harvey, Ill. 93

Barnes Solenoid-Controlled Valves

Double intermittent-duty solenoid-actuated directional control valve recently added to the line of valves for oil-hydraulic systems made by the John S. Barnes Corporation, 147 Walnut St., Rockford, Ill. The new Type 89 MEE 1/4-inch valve is a four-way two-detent positioned model. Designed for remote electrical control of direction of flow to and from a double-acting cylinder or fluid motor. Has a capacity of 3 1/2 gallons per minute under operating pressure of 1000 pounds per square inch for all ports except the drain port, which has a maximum pressure of 5 pounds per square inch. Made for intermittent operation on voltages of 110, 220, and 440. Usually mounted horizontally, but can be mounted in vertical position if desired. Also made in one intermittent-duty Type 89 ME and one continuous-duty Type 89 MEC models. 94

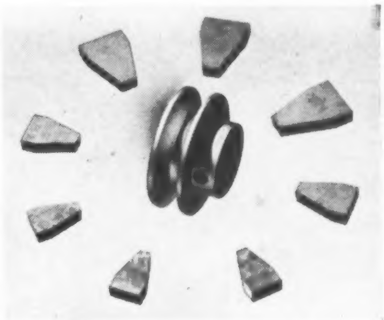


Garlock Rubber Expansion Joints

Rubber expansion joint designed for installation in pipe lines. Used for connecting pipes, this joint compensates for linear expansion and contraction of the line due to temperature changes; absorbs vibration which is destructive to mechanical equipment; reduces or eliminates the transmission of undesirable noise; and compensates for minor misalignment in the piping. Made of a rubber compound combined with plies of cotton duck, further reinforced with steel wire or rings. For service where oil resistance is necessary, the joint is available with a tube or liner made of neoprene. Manufactured by the Garlock Packing Co., Palmyra, N. Y., in sizes ranging from 2 to 72 inches for water pressures ranging from 125 to 40 pounds per square inch, respectively. 95

Cemented-Carbide Blanks for Pulley-Grooving Tools

New standardized line of solid cemented-carbide blanks designed for pulley-grooving tools, announced by the Carboloy Company, Inc., 11147 E. Eight Mile St., Detroit 32, Mich. These blanks are made in six sizes for tools used in machining pulleys for A, B, and C type V-belts, with 34- and 38-degree grooves. The blank thickness for all sizes is 5/16 inch and the length ranges from 1 to 1 1/2 inches. Tips for pulleys using belts less than 1 inch nominal width



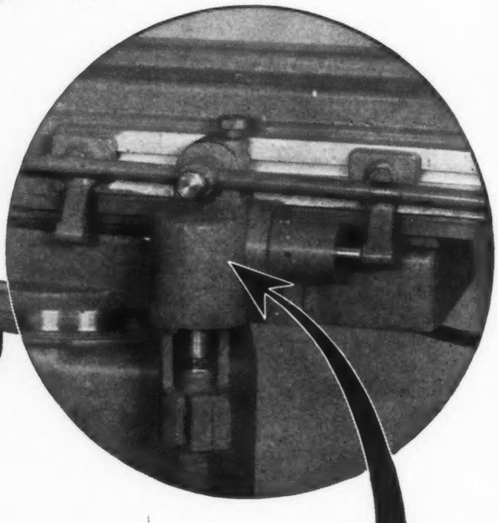
are made of Grade 883 Carboloy, while larger sizes are made of Grade 44A Carboloy. However, blanks can be supplied in other grades of Carboloy on request. 96

Veeder-Root Clutch Speed Counter

A handy clutch speed counter designed for quick checking of number of revolutions per minute to determine surface cutting speeds. Facilitates checking of motors, generators, machines, spindles, lineshafting, grinding wheels, lathes, and similar equipment. The number of revolutions per minute can be quickly and accurately determined by using this counter and any watch with a second hand. The unit counts up to 10,000 and repeats. It is compact in size, measuring only 3 1/4 inches long, 7/8 inch high, and 7/8 inch wide. Maximum speed for which this counter is recommended is 2500 R.P.M. (intermittent). Made by Veeder-Root, Inc., Hartford 2, Conn. 97

To obtain additional information on equipment described on this page, see lower part of page 208.

Cut Broach Sharpening Time 25% with



"STEP-STOP" MICRO-FEED

ON THE NEW *Colonial* UNIVERSAL BROACH SHARPENER

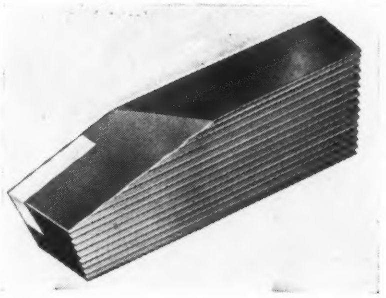
In sharpening a round broach on this Universal sharpener, the wheel is brought to depth on the first tooth. The "Step-Stop" slide is locked. The operator shifts to the next tooth and brings the wheel to full depth—to a definite stop. To his right is a micro-feed wheel with which he increases depth an amount equal to the step of the tooth. When the next tooth is ground the "Step-Stop" lets the wheel come in to this increased depth before hand-feeding with the micro-feed is required.

Where the step-per-tooth is small, the operator frequently can grind 3 or 4 teeth without using any hand feed—he just brings the wheel up against the stop each time.

Ask for Bulletin No. S-48-2

This is just one of the features of the new Colonial Universal Broach Sharpener shown here. Others include: New center-point steady rests for quicker setup; Low-inertia head; Dual head-slide handles to make both round and flat broach grinding as easy as possible for the operator... and all the other features which make Colonial's 1949 sharpeners "tops" for accuracy and speed.

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13

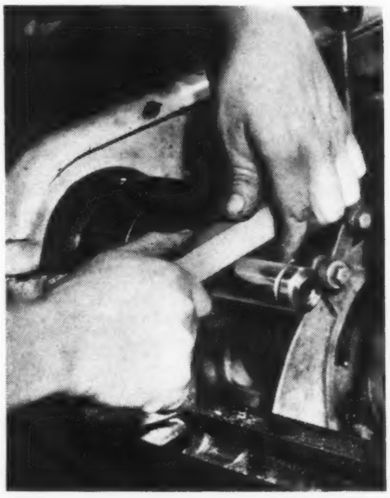


Kennametal Serrated Milling Cutter Blade

Serrated milling cutter blade having brazed-on Kennametal tip, brought out by Kennametal Inc., Latrobe, Pa. Blades of this new design are produced to specifications in a wide variety of forms and can be furnished with 90-degree or 60-degree ground serrations or other common forms of serrations, as well as types having combination plain and serrated surfaces. 98

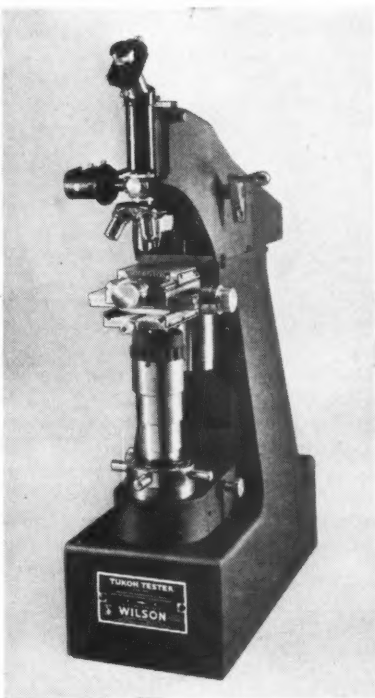
Flexible Abrasive for Cleaning and Polishing Metals

Flexible cleaning and polishing abrasive recently announced by Ideal Industries, Inc., 1011 Park Ave., Sycamore, Ill., being used to polish shaft and remove tool marks following machining operation. This new product consists of a fine-grain abrasive material, held together by a flexible bond and molded in stick form. It is said to facilitate keeping the commutators and slip rings of electric motors and generators in an efficient operating condition. When held against rotating commutator, it serves to remove high-resistance film, dirt, and grease. Since it is non-dusting, it does not affect the face of the brush nor cause filling of commutator slots. Can be used while the motor or generator is in operation, as it is non-conductive and non-loading. Will remove tool marks, scratches, or rust, leaving a highly polished finish on copper, brass, bronze, iron, steel, aluminum, and other metals. Made in five sizes from 3/8 by 1/2 inch by 5 inches up to 1 inch by 4 by 5 inches. 99



Tukon Microhardness Tester

New Model MO Tukon microhardness tester introduced by the Wilson Mechanical Instrument Co., Inc., associate company of American Chain & Cable Co., Inc., 230 Park Ave., New York 17, N. Y. This mechanically operated light load tester is designed to meet the need for an accurate and easily operated unit for use where the amount of testing does not warrant the use of a fully automatic model. It is made in both floor and bench models for applying loads of from 1 to 1000 grams, and can be employed with either the Knoop or 136-degree diamond pyramid indenters. The load is applied under dashpot control, the speed being varied from less than 0.040 inch per minute to as fast as practicable. Both rate of application and duration of applied load can be controlled. An outstanding feature is a special arrangement for removing the load without requiring the operator to touch the instrument until the indenter is withdrawn from the work. 100



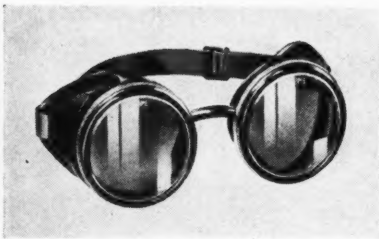
Press for Applying Protective Coating to Blueprints and Papers

A new hydraulic laminating press developed by the Studebaker Machine Co., 1221 S. 9th Ave., Maywood, Ill., for applying a plastic protective coating to blueprints, operating and safety instruction bulletins, or other papers used in manufacturing plants. The press is equipped with electrically heated platens, and has a hydraulic pressure capacity that makes it especially adaptable for plastic lamination and other operations requiring controlled heat and pressure. The plastic coating serves to seal, moisture-proof, and permanently protect the sheets treated. Six sheets 8 1/2 by 11 inches can be coated in one operation in ten minutes. 101

Heat-Confining Box for Casehardening Work

Box made from an asbestos composition to confine heat while doing casehardening work. Manufactured in three sizes by the Congress Fan & Electric Co., P. O. Box, 3747 Peninsula Station, Daytona Beach, Fla. These boxes are square, and are available in 6-, 8-, and 10-inch sizes. They are furnished with a steel work-supporting plate. 102

To obtain additional information on equipment described on this page, see lower part of page 208.

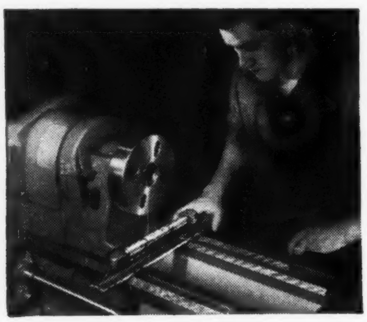


Welder's Goggle

New model welder's goggle of lightweight, strong construction, with contour-formed shields, designed for maximum comfort and protection for the wearer's eyes. Made by American Optical Co., Southbridge, Mass. 103

Precision Level for Machine Tools

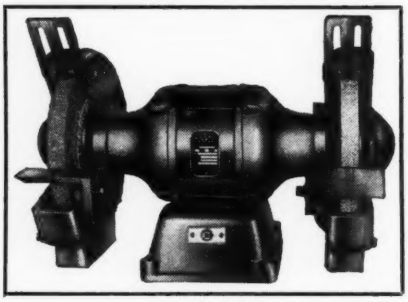
New sensitive 12-inch precision level designed especially for use in leveling machine tools. Brought out by the South Bend Lathe Works, 383 E. Madison St., South Bend 22, Ind. This level has a ground and graduated vial mounted in a 12-inch cast-iron frame, with the base precision-ground on all surfaces which can be usefully employed in leveling or setting-up machines, including the V-way for leveling shafts. The spirit



vial is protected from accidental breakage by an aluminum-alloy cylinder which can be revolved to completely enclose the vial. 104

Baldor Improved Grinder

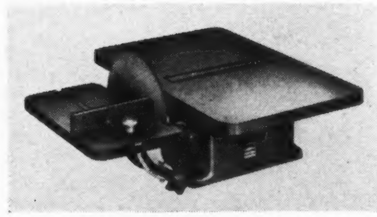
Improved 10-inch grinder recently placed on the market by the Baldor Electric Co., 4351-67 Duncan Ave., St. Louis 10, Mo. Large clearance between wheels



and motor frame is an outstanding feature of this new grinder. Other features include sealed-for-life ball bearings, exhaust type guards, spark breakers, and tool-rests which can be tilted for angle grinding. The grinder is available in single-phase 3/4-H.P. or three-phase 1-H.P. sizes. 105

Sanding Machine

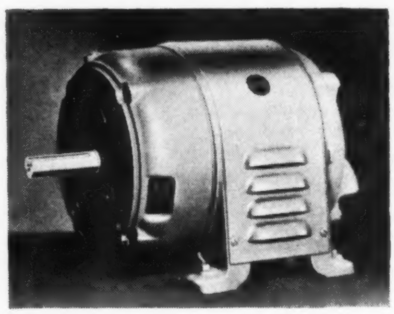
Machine provided with sanding drum 9 inches long and drum table 12 by 18 inches for accurate finishing of large-area work. The sanding drum is combined with a sanding disk 8 inches in diameter having a table 11 1/4 by 6 inches in size. A miter gage is provided which can be set at any compound angle for finishing sawed joints and ends. A 1/2-inch extension shaft facilitates the use of special grinding wheels, flexible shafts, etc. The New



Departure oil-sealed dustproof ball bearings require no lubrication. The machine is driven at a speed of between 1800 and 2000 R.P.M. by a 1/3- to 1/2-H.P. motor. Announced by Nutmeg Industries, Inc., 45 Deacon St., Bridgeport, Conn. 106

Direct Mounted Motors

Electric motor of new "Unimount" line manufactured by U. S. Electrical Motors, Inc., Los Angeles 54, Calif., and Milford, Conn., designed especially for direct connection to driven machinery. These motors are equipped with machined brackets for mounting on almost any type of power-driven machine and have been developed to save space. Integral mounting brackets offering a variety of bolt-circle and surface layouts, including footless NEMA Style C face type, registered, and other combinations can be supplied. These motors are available in size ratings of 1/2 to 500 H.P. 107



To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description — or write directly to the manufacturer, mentioning machine as described in August, 1949, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

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New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 214 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the August, 1949, Number of MACHINERY

Hydraulic Straightening Presses

AMERICAN BROACH & MACHINE Co., Ann Arbor, Mich. Circular 215, describing the features of the company's line of hydraulic straightening presses, made in 15-, 25-, 35-, and 50-ton capacities. Complete specifications are included. Copies will be sent to those who request them on a company letter-head addressed directly to the American Broach & Machine Co.

Forgings

PITTSBURGH FORGINGS Co., Department P, Coraopolis, Pa. Publication containing 64 pages illustrating step-by-step operations in the forging of automotive, freight-car, farm-implement, and miscellaneous products. Copies available without charge to design engineers, production executives, metallurgists, and purchasing agents, if requested on business stationery addressed directly to the company.

Hard-Facing Wire

WALL COLMONOY CORPORATION, 19345 John R St., Detroit 3, Mich. Booklet containing technical information on Colmonoy "Spraweld" wire, a hard-facing wire for use in metallizing guns. Complete application instructions are given, including surface preparation, spraying and fusing, and cooling and finishing. 1

Corrugated Expansion-Joint Design Guide

CHICAGO METAL HOSE CORPORATION, Maywood, Ill. Design Guide for the selection and application of corrugated expansion joints, containing technical information of value in choosing the correct size and type to meet varying requirements. 2

Corrosion Prevention by Metallizing

METALLIZING ENGINEERING Co., INC., 38-14 Thirtieth St., Long Island City 1, N. Y. Bulletin 62, describing how the metallizing process can be applied to prevent corrosion of iron and steel equipment by spraying it with zinc or aluminum. 3

Drill Cabinets

HUOT MFG. Co., 550 N. Wheeler St., St. Paul W4, Minn. Folder descriptive of the Huot "drill dispenser," a drill cabinet provided with separate compartments for different sized drills, which are clearly marked on the front of the drawers so that the required size of drill can be readily located. 4

Tank Heating

KOLD-HOLD MFG. Co., Lansing 4, Mich. Bulletin describing a new method of heating tanks that involves the use of what is known as a "Platecoil"—a light-weight embossed plate through which the heating solution passes. Also applicable for cooling high-temperature solutions. 5

Combination Etcher and Demagnetizer

CROWN INDUSTRIAL PRODUCTS Co., 1327 W. 69th St., Chicago, Ill. Circular illustrating and describing a new combination etcher and demagnetizer for marking and demagnetizing tools and other iron and steel parts in one operation. 6

Deep-Hole Hydraulic Drilling Machines

AVEY DRILLING MACHINE Co., Cincinnati 1, Ohio. Folder illustrating typical applications of Avey-Draulic deep-hole drilling units with Torque-matic control. Production data for each set-up is included. 7

Hydraulic Equipment

DENISON ENGINEERING Co., 1152 Dublin Road, Columbus 16, Ohio. Booklet entitled "A Quick Review of Denison Products," briefly describing the line of Multipresses, pumps, fluid motors, and other hydraulic equipment made by the company. 8

Alternating-Current Welders

WESTINGHOUSE ELECTRIC CORPORATION, Buffalo, N. Y. Booklet entitled "Why Didn't They Tell Me About This Before?" containing information on alternating-current welding. One section gives the causes and cures of fourteen common welding problems. 9

Press Rebuilding Service

VERSON ALLSTEEL PRESS Co., 9309 S. Kenwood Ave., Chicago 19, Ill. Bulletin describing the facilities of the company for rebuilding presses of all sizes. Typical examples of rebuilding and repair jobs are illustrated. 10

Precision Motor Drive Control

RELIANCE ELECTRIC & ENGINEERING Co., 1111 Ivanhoe Road, Cleveland 10, Ohio. Bulletin K-2325, describing the Reliance section interlock regulator, a precision speed control for coordinated motor drives such as are used in processing operations. 11

Automatic Air Chucks

WHITON MACHINE CO., New London, Conn. Bulletin A-1, describing the "Air-O-Torque" automatic chuck with a through center hole for use on lathes, boring mills, automatic chucking machines, and special-purpose machines. 12

Alloy Steel Data

WHEELOCK, LOVEJOY & CO., INC., 128 Sidney St., Cambridge 42, Mass. Revised alloy steel data catalogue, including complete information on the company's line of Hy-Ten, A I S I, and S A E alloy steels. 13

Heat-Treating of Steels

COOLEY ELECTRIC MFG. CORPORATION, Indianapolis, Ind. Booklet entitled "Shop Notes on Heat-Treating of Steels," discussing, in a non-technical manner, typical heat-treating procedures and giving suggestions for obtaining better results. 14

Variable-Pitch V-Belt Sheaves

V-BELT ENGINEERING CO., Richmond, Va. Circular describing four important features of "Maxi-Pich" V-belt sheaves designed to provide maximum pitch variation and constant belt alignment. Dimensions are included. 15

Welding Cast-Iron Parts

AIR REDUCTION SALES CO., 60 E. 42nd St., New York 17, N. Y. Bulletin entitled "Repairing Gray Iron Castings by Welding," describing case histories covering the repair and maintenance by welding of cast parts. 16

Car-Wheel Lathe

BULLARD CO., Bridgeport 2, Conn. Circular outlining the advantages of the new Bullard 54-inch Man-Au-Trol car-wheel lathe, and giving performance data. 17

Tap-Driving Equipment

SCULLY-JONES & CO., 1906 S. Rockwell St., Chicago 8, Ill. Folder 123-1, containing complete information on Scully-Jones tap chucks, tap-holders, and tap-drivers. 18

Meehanite Castings

MEEHANITE METAL CORPORATION, Pershing Square Bldg., New Rochelle, N. Y. Bulletin 31, entitled "Meehanite Means Better Castings"—fourth of a series of application and engineering data booklets on Meehanite. 19

Carbide-Insert Tools

CARBOLOY COMPANY, INC., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Supplement 7 to the company's general tool catalogue covering the company's expanded line of mechanically held solid-carbide insert tools. 20

Wheel-Forming Attachment

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford 1, Conn. Catalogue illustrating and describing the new Diaform wheel forming attachment for the precision dressing of grinding wheels. 21

Hydraulic Presses

ACME BROACH CORPORATION, Milan, Mich. Bulletin P-49, illustrating and describing Acme vertical hydraulic presses for broaching, forcing, straightening, staking, assembling, and general purpose operations. 22

Shop Tools

BILLINGS & SPENCER CO., Hartford 1, Conn. Folder CP93, illustrating and describing various shop tools, including clamps, lathe dogs, chain-pipe vises, screw-drivers, hammers, etc. 23

Power Driver

MINE SAFETY APPLIANCES CO., Braddock, Thomas, and Meade Sts., Pittsburgh 8, Pa. Bulletin TA-17, describing and illustrating the M. S. A. velocity-power driver for rapidly driving steel studs into steel and other materials. 24

Air and Hydraulic Cylinders

MODERNAIR CORPORATION, 4222 Hollis St., Oakland 8, Calif. Catalogue containing complete engineering data on a new line of low-priced feed-ring series cylinders suitable for air, water, or hydraulic service. 25

Hydraulic Products

COMMERCIAL SHEARING & STAMPING CO., Youngstown, Ohio. Folder covering the line of hydraulic products made by this concern, including pumps and motors, valves, cylinders, and manually operated units. 26

Hand-Operated Chucks

CUSHMAN CHUCK CO., Hartford, Conn. Catalogue 64, covering the company's complete line of hand-operated chucks, including independent chucks, self-centering chucks, combination chucks, and collets. 27

Induction Motors

ELECTRIC MACHINERY MFG. CO., Minneapolis 13, Minn. Bulletin entitled "The ABC of Large Induction Motors," describing the operation, characteristics, applications, and control of these motors. 28

Speed Reducers

D. O. JAMES GEAR MFG. CO., 1140 W. Monroe St., Chicago 7, Ill. Leaflet illustrating and describing various types of gear speed reducers made in a wide range of sizes and ratios. 29

Airflow Gaging Equipment

SHEFFIELD CORPORATION, Dayton 1, Ohio. Catalogue CTP-491, illustrating and describing the various standard models of Precisionaire gages, as well as numerous special applications. 30

Taper Bridge Reamers

NATIONAL TWIST DRILL & TOOL CO., Rochester, Mich. Supplement to Catalogue 16, containing dimensions and prices of long and short set taper bridge reamers. 31

Firthite Tips and Blanks

FIRTH STERLING STEEL & CARBIDE CORPORATION, McKeesport, Pa. Catalogue Section 60-010, containing specifications and list prices on Firthite tips and blanks, listing all grades and sizes. 32

Drilling Machines

FOSDICK MACHINE TOOL CO., Cincinnati 23, Ohio. Catalogue 40, containing complete data on the new Fosdick sensitive radial drills. Catalogue 36, describing the construction of the company's Economax line of hydraulic radial drills, including specifications. 33

Cutting Tools

SPECIAL CUTTER & TOOL CO., 401 Salliotte St., Ecorse 29, Mich. Bulletin describing the company's specialized service in making cutters, reamers, and related products to conform with customers' specifications. 34

Pneumatic Die Cushions

E. W. BLISS CO., Toledo 7, Ohio. 56-page reference manual on the general uses, advantages, and maintenance of press pneumatic and hydro-pneumatic die cushions and allied equipment. 35

Corrosion-Resistant Alloys

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y. Technical bulletin T-3, on the resistance of high-nickel alloys to corrosion by sulphuric acid. 36

Variable-Ratio Speed-Changer

METRON INSTRUMENT CO., 432 Lincoln St., Denver 9, Colo. Bulletin 99, containing data on the Metron Type 4A miniature variable-ratio speed-changer. 37

Aluminum Stampings and Assemblies

REYNOLDS METALS CO., 2000 S. Ninth St., Louisville 1, Ky. Booklet illustrating the many applications of aluminum stampings and assemblies in industry. 38

Socket Screw Products

BRIGHTON SCREW & MFG. CO., Cincinnati 2, Ohio. Catalogue 23, presenting the complete line of "B-Right-On" socket screw products, including latest list prices and specifications. 39

Welding-Gun Balancer

PLATZ CO., 20433 Sherwood Ave., Detroit 12, Mich. Circular illustrating and describing the new Platz portable welder-gun balancer and hanger for use on production lines. 40

Gearmotors

LINK-BELT CO., 307 N. Michigan Ave., Chicago 1, Ill. Catalogue 1815A, containing design data and selection tables for Link-Belt double- and triple-reduction gearmotors. 41

Solenoid Air Valves

VALVAIR CORPORATION, Akron, Ohio. Folder S, announcing a new and improved line of solenoid-operated valves for air pressures of 0 to 125 pounds per square inch. 42

Taps

WINTER BROTHERS CO., DIVISION NATIONAL TWIST DRILL & TOOL CO., Rochester, Mich. Catalogue describing the design of Winter "balanced action" taps. 43

Welding Directories

LINCOLN ELECTRIC CO., Cleveland 1, Ohio. Directory of welding supplies, designated Bulletin 467, and field service welding directory (Bulletin SD4). 44

Industrial Models

MARCO MFG. CO., 132 E. Crosier St., Akron 11, Ohio. Circular announcing this company's industrial model and fabrication services. 45

War Surplus Machinery

ACME EQUIPMENT CO., INC., 126 S. Clinton St., Chicago 6, Ill. Bulletin 92, listing war surplus machine tools, hoists, lift-trucks, cranes, and special equipment. 46

Heat-Treating Equipment

SURFACE COMBUSTION CORPORATION, Toledo 1, Ohio. Bulletin SC-143, descriptive of gas-fired air heaters and their applications on a wide range of industrial heating jobs. 47

Portable Electric Tools

INDEPENDENT PNEUMATIC TOOL CO., Aurora, Ill. Folder illustrating and describing the various models in the new Thor Silver line of portable electric tools. 48

Air Power Tools

MEAD SPECIALTIES CO., 4114 N. Knox Ave., Chicago 41, Ill. General catalogue covering the company's line of air cylinders and air-operated devices. 49

Resistance Welders

TAYLOR-WINFIELD CORPORATION, Warren, Ohio. Bulletin 8-013, descriptive of the four basic types of multiple spot-welding machines made by this company. 50

Cold-Forged Socket Screws

HOLO-KROME SCREW CORPORATION, Hartford 10, Conn. Price list 49, covering standard and special sizes of Holo-Krome cold-forged socket screw products. 51

Bearing Bronze Chart

MAGNOLIA METAL CO., Elizabeth, N. J. Chart giving stock sizes of Magnolia isotropic die-cast bearing bronze. 52

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (August, 1949) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

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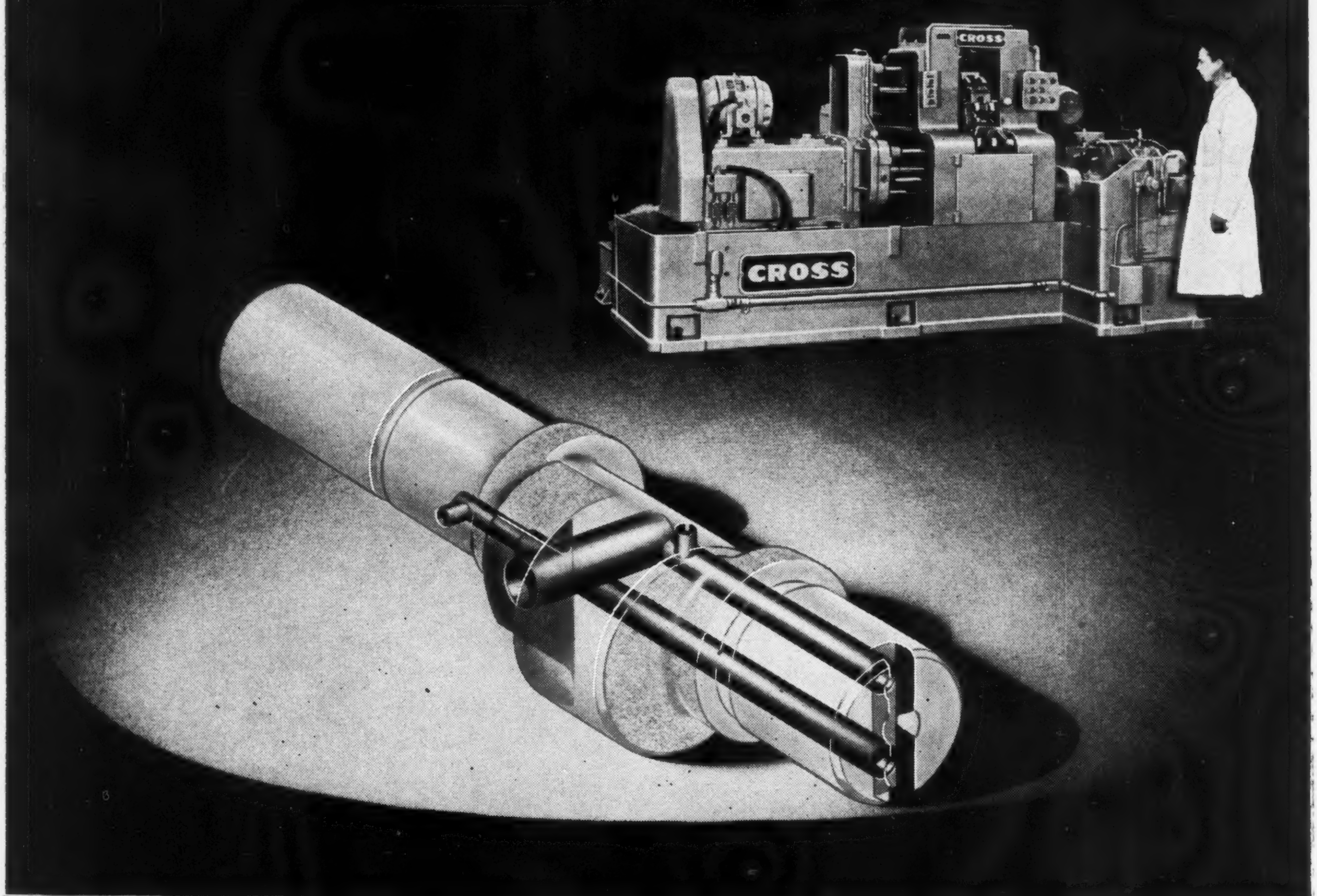

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MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

BETWEEN GRINDS

By E.S.S.

Catching Curves — Ship to Auto, That Is

Would you look blank if someone referred to the "tumblehome curve" now popular in industrial design? No need to—the side of the latest Ford automobile body, with which you are familiar, exemplifies it. A mariner's term, the "tumblehome" has been used by English sailors since the Seventeenth Century to describe a ship's sides when they incline inward.

Glad Hand in Print

The Yoder Co. greets you with a written hello—that is the title of a booklet available to visitors in their reception room. Here are the headings on each page of "Hello": Welcome to The Yoder Co.; Make Yourself at Home; Persons You May Wish to See; Our Company—Its Purpose; A Few of Our Products; and Notes on Your Visit Here (this a blank page which will possibly be filled, not only by official data, but by figures to be added to your expense account, the artwork of which you are guilty, or your home town done in Old English and garnished with U.S.A.) It fills front office to inner sanctum gap.

Applied Arithmetic — Southern Style

One of our subscription men told us that in a saw mill machine shop down South, he was asked to settle a $3 bet as to which was larger—1/16 or 1/32—two workers taking opposite sides. Our man simply drew a circle representing a juicy Southern shortcake and divided it into portions. The 1/32 bettor recognized that he would have been shortcaked had he held out for his measurement.

Caught on Cover

A forty-page book catalogue issued by the Popular Mechanics Press bobbed up on our desk and stopped the musing we were doing. Its cover pictured a bright, pencil-on-ear scholar studying a book—but not just any book—for standing out was the title, "Ingenious Mechanisms for Designers and Inventors," one of MACHINERY's best-sellers.

The Three B's Plus One Punch a Time Clock

Bach, Beethoven, Brahms, and Bebop now soothe the worker in a Midwest factory that manufactures power transmission drives. A Hammond electric organ has been installed as a working incentive, and an organist is ready and willing during the periods between 7 and 9 A.M. and 2 and 5 P.M. to play all employes' requests. We hope Junior doesn't save his practicing for the evening hours at home.

Let C's be Unconfined

For creating an effective sales proposal, sales consultant David Guy Powers suggests the three C's: clarity, compactness, and concreteness. They're good in any deal.

Bell Courtesy or Coincidence?

To obtain some information on a Spanish manufacturer, we telephoned the Spanish Consulate in New York City—whose telephone exchange is El Dorado.

The Viking who Keeps Pace—HANS BRANDERS, whose home is Karhula, Finland, has progressed in the field of engineering at a tempo familiar to our energetic American engineers. Born in Helsingfors, Finland, in 1903, he graduated from the Institute of Technology in that city with the degree of mechanical engineer. Several years spent in machine shops prepared him for his association in 1930 with one of the biggest industrial enterprises in Finland — the A. Ahlstrom OY. Mr. Branders is now production manager at the machine shops of the Karhula Works, which produce machinery for

pulp and steel mills and for the mining industry, as well as centrifugal pumps and rear axles for Finnish trucks and busses. He has been a member of the Society of Automotive Engineers since 1926, and has published many articles in the Scandinavian technical magazines on automotive engineering and machine shop practice. Mr. Branders, who evinces a fine command of the English language in his correspondence, has now extended his scope to include MACHINERY, as you may see by reading the article appearing on page 164 of this issue.

News of the Industry

California

D. C. STUBER has been named sales manager for the Southern California territory by the Dayton Rogers Mfg. Co., Minneapolis, Minn. He will make his headquarters at 7266 Beverly Blvd., Los Angeles 36, Calif.

Connecticut

HARTFORD SPECIAL MACHINERY CO., Hartford, Conn., announces that the company has purchased the special drilling machinery line formerly manufactured by the LANGELIER MFG. CO., of Cranston, R. I. The following Langelier personnel will be employed by the new owner: ANTHONY E. WARD, chief engineer of the Drilling Division; WILLIAM E. COVILL, JR., chief draftsman; RUDOLPH KAMINSKI, sales supervisor; and O. L. WRIGHT, factory supervisor. The company also announces that two other lines, consisting of an automatic thread-rolling machine and a die polishing machine, have recently been acquired and will be produced at Hartford.

ALEXANDER H. D'ARCAMBAL, vice-president and consulting metallurgist of Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., had conferred upon him the degree of Metallurgical Engineer by his Alma Mater, the University of Michigan, during the recent commencement exercises. Although majoring in metallurgical studies during his undergraduate work at the University, he received the degree of Bachelor of Chemical Engineering upon graduating in 1912, as that was the only degree awarded by the University of Michigan at that time covering this type of study and research.

W. M. WALKER has been appointed district manager in the Cleveland area for the Torrington Co., Torrington, Conn. J. N. WHOLEAN has been transferred from the Milwaukee office to the Cleveland office as district engineer, and R. U. SAUTTER has been transferred from the engineering department of the Bantam Bearing Division of the company at South Bend to the Milwaukee office as district engineer.

ROBERT J. MCKENNA, formerly vice-president of the Storms Drop Forging Co., Springfield, Mass., has been made New England representative of the Billings & Spencer Co., Hartford, Conn., manufacturer of precision and commercial drop-forgings. His headquarters will be at the main office in Hartford.

STANLEY E. PETERSON has been promoted to the position of vice-president and secretary of the Whiton Machine Co., New London, Conn., and WALTER E. BEANEY has been made vice-president and factory manager.

JOHN L. MACQUOWN has been named to represent the Warner & Swasey Co. in Hartford, Conn., supplementing the Cambridge, Mass., district sales office activity.

Illinois and Indiana

LINK-BELT CO., 307 N. Michigan Ave., Chicago 1, Ill., announces the removal of the following offices to larger quarters: The Cleveland office is now located at 314 Hanna Bldg., Cleveland 15; the Baltimore office has been moved to 2315 St. Paul St., Baltimore 18; the Huntington, W. Va., office is now at 1009 Fifth Ave., Huntington 1; and the present location of the Newark, N. J., office is 212 Essex Bldg., 31 Clinton St., Newark 2.

J. L. MCDERMOTT has been appointed manager of the Ryertex Division of Joseph T. Ryerson & Son, Inc., Chicago, Ill., succeeding KENNETH T. MACGILL, who is retiring after thirty-two years of service. Mr. McDermott was promoted from the post of western sales manager of the division.

E. PALMER MEREDITH has been appointed district sales engineer for the V & O Press Co., Hudson, N. Y., in the Chicago vicinity.

STEWART WARNER CORPORATION, Chicago, Ill., announces that the South Wind Division of the corporation, located at Indianapolis, Ind., has entered into the custom production of finished machined parts. A. J. FRIELING has been appointed field representative for the new department, with headquarters in the General Motors Bldg., Detroit, Mich.

JOHN S. MICHIE, formerly of Diebold, Inc., Canton, Ohio, has been appointed works manager of the Reeves Pulley Co., Columbus, Ind., manufacturer of variable-speed control equipment. Mr. Michie succeeds H. E. BROOKS, who recently retired after being connected with the company for twenty-nine years.

Maryland and Washington, D. C.

BALMAR CORPORATION, Baltimore, Md., a subsidiary of the FRANKLIN RAILWAY SUPPLY CO., 60 E. 42nd St., New York City, announces that the business of N. A. STRAND & CO., 5001 N. Wolcott Ave., Chicago, Ill., has been acquired by the corporation, and will be known hereafter as the N. A. STRAND CO., DIVISION OF THE BALMAR CORPORATION. The new division will continue to manufacture the Strandflex line of flexible-shaft machine tools.

WESTON ELECTRICAL INSTRUMENT CORPORATION, Newark, N. J., and its subsidiary, the C. J. TAGLIABUE CORPORATION (N. J.), announce the establishment of a district sales office at 6230 Third St., N. W., Washington, D. C., with LAWRENCE F. PARACHINI in charge as district manager.

Massachusetts

GREENFIELD TAP & DIE CORPORATION, Greenfield, Mass., announces the removal of its Ampco twist drill manufacturing facilities from Jackson, Mich., to Greenfield. The corporate structure of the AMPCO TWIST DRILL CORPORATION has been dissolved and all assets transferred to Greenfield. FRANK J. SIKOROVSKY, president and general manager of the former Ampco Twist Drill Corporation, becomes a vice-president and director of the Greenfield Tap & Die Corporation.

PARKER MFG. CO., Worcester, Mass., announces the acquisition of the ACKERMANN-STEFFAN CO., Chicago, Ill., manufacturer of Trojan coping, jig, power machine, and jewelers' saw blades and coping, jewelers', scroll, and hacksaw frames. The newly acquired company will be known as the ACKERMANN-STEFFAN DIVISION OF THE PARKER MFG. CO., and will continue to manufacture the same group of products at 4532 Palmer St., Chicago.

FARREL-BIRMINGHAM CO., INC., Ansonia, Conn., has appointed WARREN M. PIKE, 274 Franklin St., Boston 10,

MACHINERY'S DATA SHEETS 639 and 640

SPEEDS AND FEEDS FOR MACHINING STAINLESS-STEEL BARS—1

	AISI Type of Cold-Drawn Stainless-Steel Bar*									
	416 and 430-F		303		430 and 410		302 and 304		420	
	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution
Drill Diameter, Inch	**Drilling**									
1/4	100	0.0035	63	0.0040	57	0.0028	48	0.0033	60	0.0028
1/2	100	0.0040	63	0.0045	57	0.0031	48	0.0036	60	0.0031
3/4	105	0.0047	69	0.0055	62	0.0037	52	0.0044	65	0.0037
1	105	0.0055	69	0.0064	62	0.0044	52	0 0051	65	0.0044
1 1/4	110	0.0064	72	0.0070	65	0.0050	54	0.0058	68	0 0050
Reamer Diameter, Inch	**Reaming**									
Under 1/2	132	0.0050	87	0.0060	78	0.0038	66	0.0046	83	0.0040
1/2 or Over	132	0.0072	87	0.0085	78	0.0054	66	0.0066	83	0.0057
Width of Cut, Inches	**Form-Cutting, Circular or Dovetail Tools**									
1/2	150	0.0018	100	0.0021	90	0.0014	75	0.0016	95	0.0014
1	145	0.0014	96	0.0017	87	0.0011	73	0.0013	91	0.0012
1 1/2	145	0.0013	96	0.0015	87	0.0010	73	0.0012	91	0.0010
2	140	0.0011	93	0.0013	84	0.0008	70	0.0010	88	0.0009
2 1/2	135	0.0009	90	0.0010	81	0.0007	68	0.0008	85	0.0007

*The main chemical components, in per cent, of the steels listed, are as follows:

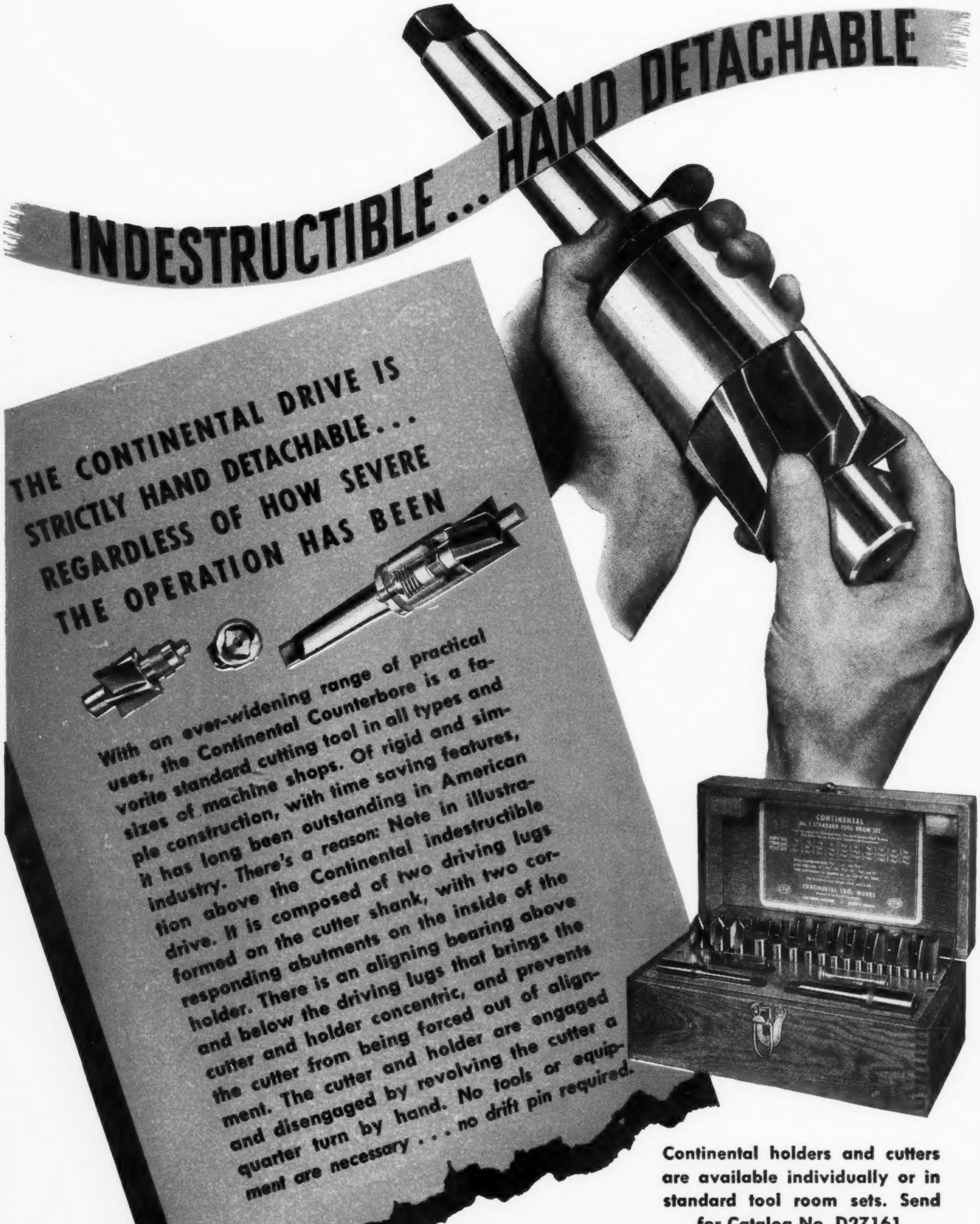
	416	430-F	303	430	410	302	304	420
Chromium	12 to 14	14 to 18	17 to 19	14 to 18	11.5 to 13.5	16 to 18	18 to 20	12 to 14
Nickel	....	....	8 to 10	....	....	6 to 8	8 to 11	....
Carbon	0.15	0.12	0.20	0.12	0.15	0.08 to 0.20	0.08	0.15

MACHINERY'S Data Sheet No. 639, August, 1949 — Compiled by Republic Steel Corporation

SPEEDS AND FEEDS FOR MACHINING STAINLESS-STEEL BARS—2

	AISI Type of Cold-Drawn Stainless-Steel Bar									
	416 and 430-F		303		430 and 410		302 and 304		420	
	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution	Surface Feet per Minute	Feed, Inch per Revolution
Depth of Cut, Inch	**Turning, Box-Tools**									
1/8	150	0.0050	100	0.0059	90	0.0038	75	0.0046	95	0.0040
1/4	145	0.0047	96	0.0055	87	0.0035	72	0.0043	91	0.0037
3/8	140	0.0040	93	0.0047	84	0.0030	70	0.0036	88	0.0031
1/2	135	0.0032	90	0.0040	81	0.0024	68	0.0030	85	0.0026
Depth of Cut, Inch	**Milling, Hollow Mills**									
1/16	135	0.0072	90	0.0085	81	0.0054	68	0.0060	85	0.0057
1/8	127	0.0058	84	0.0068	76	0.0043	64	0.0053	80	0.0046
3/16	123	0.0050	81	0.0060	73	0.0038	61	0.0046	77	0.0040
1/4	118	0.0047	78	0.0055	70	0.0035	59	0.0043	74	0.0037
	Knurling									
	150	0.011	100	0.012	90	0.0089	75	0.0099	95	0.0085
	Chamfering and Facing									
	182	0.005	120	0.006	108	0.0037	91	0.0046	114	0.0042
Width of Cut, Inch	**Cutting Off**									
1/16	150	0.0015	100	0.0017	90	0.0011	75	0.0013	95	0.0011
1/8	159	0.0020	105	0.0021	95	0.0013	79	0.0016	100	0.0014
3/16	163	0.0020	108	0.0021	98	0.0013	82	0.0016	103	0.0014
1/4	172	0.0024	114	0.0025	103	0.0016	86	0.0020	108	0.0017

MACHINERY'S Data Sheet No. 640, August, 1949 — Compiled by Republic Steel Corporation


INDESTRUCTIBLE... HAND DETACHABLE
THE CONTINENTAL DRIVE IS STRICTLY HAND DETACHABLE... REGARDLESS OF HOW SEVERE THE OPERATION HAS BEEN
With an ever-widening range of practical uses, the Continental Counterbore is a favorite standard cutting tool in all types and sizes of machine shops. Of rigid and simple construction, with time saving features, it has long been outstanding in American industry. There's a reason: Note in illustration above the Continental indestructible drive. It is composed of two driving lugs formed on the cutter shank, with two corresponding abutments on the inside of the holder. There is an aligning bearing above and below the driving lugs that brings the cutter and holder concentric, and prevents the cutter from being forced out of alignment. The cutter and holder are engaged and disengaged by revolving the cutter a quarter turn by hand. No tools or equipment are necessary . . . no drift pin required.
Continental holders and cutters are available individually or in standard tool room sets. Send for Catalog No. D27161.
49-29
CONTINENTAL TOOL WORKS
EX-CELL-O CORPORATION
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CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Mass., New England representative for the line of gears and gear units manufactured at the company's Buffalo plant.

THREADWELL TAP & DIE CO., Greenfield, Mass., has purchased the CONANT & DONELSON CO., Conway, Mass., manufacturer of "Reliable" taps, dies, and screw plates. Production has been transferred to the Threadwell plant.

Michigan and Wisconsin

OREN G. RUTEMILLER has been appointed chief engineer of the Morton Mfg. Co., Muskegon Heights, Mich., manufacturer of draw-cut machine tools and special machinery. For the last few years, he has been consulting engineer for several machine tool and special machinery manufacturers in the Cincinnati area. H. A. OSBORNE has been appointed manager of the Welding Fixture Division of the company, which has recently been expanded by the acquisition of the line of standard and special automatic welding fixtures formerly manufactured by INTER-OCEAN INDUSTRIES, of Chicago.

COLONIAL BROACH CO., Box 37, Harper Station, Detroit 13, Mich., announces the establishment of a Production Broaching Division, designed to help manufacturers whose broaching requirements do not warrant the purchase of broaching machines; to assist manufacturers in experimental production work prior to retooling their own facilities; and to provide service to manufacturers who are awaiting delivery of broaching equipment. The new department is completely equipped to handle either internal or surface bhoaching.

STURGIS PRODUCTS CO., Sturgis, Mich., manufacturer of Roto-Finish materials, equipment, and processes for mechanical finishing, has changed its corporate name to the ROTO-FINISH CO., and moved all sales and manufacturing activities to its new plant in Kalamazoo, Mich.

JOHN D. TEBBEN has announced the organization of a consulting engineering company at Detroit, Mich., specializing in engineering sales and industrial relations. Headquarters of the new company will be at 20869 Mound Road, Detroit.

F. K. KRELL, Chicago district sales representative of the Globe Steel Tubes Co., Milwaukee, Wis., has been promoted to the position of manager of sales, welding fittings. He will be succeeded at Chicago by JOHN KOSS, formerly in charge of export sales. JOHN F. SCOTT, sales representative for the New York district, has been advanced to the position of manager of sales, stainless and alloy tubing. His position as New York district representative will be filled by J. J. LUKENS, previously head of the pricing division.

Missouri

ROGER W. BATCHELDER has been appointed vice-president in charge of sales of the National Bearing Division of the American Brake Shoe Co., New York City. He will continue to be located at the headquarters of the Division in St. Louis, Mo. Mr. Batchelder was formerly assistant to the president of the National Bearing Division.

FRANK M. GOODMAN has been appointed sales promotion manager of the Industrial Division of the Lincoln Engineering Co., St. Louis, Mo., manufacturer of industrial lubricating equipment and centralized lubricating systems. Previous to his present appointment, Mr. Goodman had been associated with Skilsaw, Inc., for sixteen years.

COLUMBIA TOOL STEEL CO., Chicago Heights, Ill., has opened a new sales office and warehouse at 5118 Easton Ave., St. Louis 13, Mo., where a complete stock of high-speed, alloy, and carbon tool steels will be carried.

New Jersey

HOBART C. RAMSEY has been elected president of the Worthington Pump & Machinery Corporation, Harrison, N. J., succeeding CLARENCE E. SEARLE, who is now vice-chairman of the board. Mr. Ramsey was previously executive vice-president, which position will be filled by E. J. SCHWANHAUSSER. JOHN J. SUMMERSBY has been elected vice-president in charge of sales.

BOUND BROOK OIL-LESS BEARING CO., Bound Brook, N. J., announces the election of the following officers: W. F. JENNINGS, president and treasurer; H. O. JOHNSON, executive vice-president and secretary; GEORGE O. SMALLEY, vice-president; and W. R. TOEPLITZ, vice-president in charge of engineering research.

AIR ASSOCIATES, INC., has been appointed distributor of the line of aircraft "Speed" nuts and clips made by TINNERMAN PRODUCTS, INC., Cleveland, Ohio. Stocks of these products will be maintained at the distributors' warehouses in Teterboro, N. J., Los Angeles, Calif., Dallas, Tex., and Chicago, Ill.

JAMES CORBIN & ASSOCIATES, 2854 Hudson Boulevard, Jersey City, N. J., have been organized to engage in an industrial scrap marketing service.

New York

ARTHUR H. BUNKER, a director of the Climax Molybdenum Co., New York City, has been elected president of the company. Mr. Bunker was formerly a partner of Lehman Brothers. He has held many prominent positions during his business career; in 1923, he founded and became the first president of the U. S. Vanadium Corporation, and subsequently was president of the Carib Syndicate, Ltd., and the Colon Oil Corporation. During World War II, he was associated with the War Production Board, ultimately serving as its Chief of Staff.

LAWRENCE E. DICKSON, president of the Standard Safety Equipment Co., Chicago, Ill., was elected president of the Industrial Safety Equipment Association for the second consecutive year at the recent annual meeting. CHARLES H. GALLAWAY, sales manager of the American Optical Co.'s Safety Products Division, was elected vice-president, succeeding WALTER G. LEGGE. Headquarters of the Association are at 366 Madison Ave., New York 17, N. Y.

HOWARD M. DAWSON has been appointed sales manager of the New York and Philadelphia offices of the Firth Sterling Steel & Carbide Corporation, McKeesport, Pa. He succeeds A. E. BARKER, who was recently promoted to the position of assistant to the president. Mr. Dawson was formerly president of the Jessop Steel International Co., of New York.

CLYDE C. RANDOLPH has been made acting works manager of the Western Electric Co.'s Point Breeze Works in Baltimore, and has also been appointed works manager of the Tonawanda plant in Buffalo, N. Y., and the Allentown plant in Allentown, Pa. He succeeds ARTHUR B. GOETZE, who has been elected vice-president in charge of personnel of the Chesapeake & Potomac Telephone Co.

WEGNER MACHINERY CORPORATION, 35-41 Eleventh St., Long Island City, N. Y., has been appointed service dealer in metropolitan New York, Connecticut, and New Jersey for the line of presses built by the E. W. BLISS CO., Toledo, Ohio. The Wegner Machinery Corporation will rebuild Bliss presses in its own plant or in customers' plants.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y., announces that it has purchased from the War Assets Administration a former war plant at 344 Vulcan St., Tonawanda, N. Y. The recently acquired plant will be operated by the company's Ramapo Ajax Division, manufacturer

of railroad frogs, switches, and special track work.

RICHARD N. CHAPIN has been made general purchasing agent of Air Reduction, 60 E. 42nd St., New York 17, N. Y., manufacturer of industrial gases and welding equipment. He succeeds WALTER R. CLARK, who recently resigned.

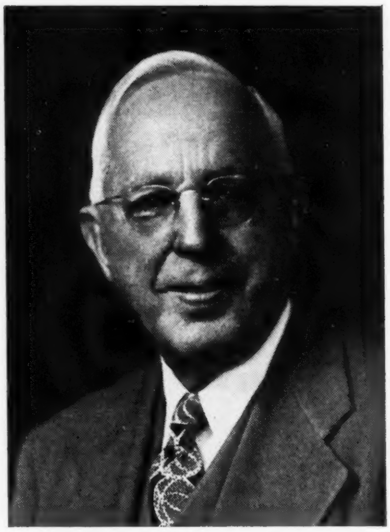
HENRY V. BOOTES, formerly assistant vice-president of the American Car & Foundry Co., New York City, has been elected vice-president in the sales department. His headquarters will continue to be in New York.

GENERAL BREHON SOMERVELL, president of Koppers Co., Inc., has been elected a member of the board of directors of the Carborundum Co., Niagara Falls, N. Y.

CHARLES C. CHEYNEY and ARTHUR M. KIELY have been elected directors of the Buffalo Forge Co., Buffalo, N. Y.

Ohio

CARL F. ROBY, vice-president of the Cincinnati Milling Machine Co., Cincinnati, Ohio, was recently elected a director, and SWAN E. BERGSTROM, sales manager, was named vice-president. GEORGE W. BINNS and LESTER F. NENNINGER were elected vice-presidents and directors of Cincinnati Milling and Grinding Machines, Inc., sales subsidiary of the Cincinnati Milling Machine Co. Mr. Binns has been associated with the company since 1906, having been one of the first cooperative class students of the University of Cincinnati. Mr. Nenninger started with the company in 1912, and has held the position of works manager since 1943.



(Left to Right) George W. Binns and Lester F. Nenninger, newly elected vice-presidents and directors of Cincinnati Milling and Grinding Machines, Inc.

E. W. BLISS CO., Toledo, Ohio, announces that the manufacture of the company's single- and double-crank presses up to 250 tons capacity and certain semi-automatic cam machinery is now being conducted at the Hastings, Mich., plant. The new press lines will be manufactured on a standards program similar to that employed in the manufacture of Bliss inclinable presses, so that assemblies for the presses will be interchangeable as far as possible. Announcement has also been made of the closing of the Englewood, N. J., plant and the re-opening of the Eastern Parts Sales and Service administration offices at 19 E. 47th St., New York City.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has recently completed arrangements for the construction of an $8,500,000 plant to be erected in Euclid, Ohio, on a 65-acre site. The new one-story manufacturing plant will contain over 850,000 square feet of floor area, and is expected to provide sufficient space to take care of all manufacturing operations carried on at the present plant and permit future expansion. The entire plant has been designed to reduce materials-handling cost to a minimum. The new factory is expected to be ready for operation in 1950.

HAMILTON-THOMAS CORPORATION, Hamilton, Ohio, has announced the acquisition of the SMITH & MILLS CO., Cincinnati, Ohio, manufacturer of crank shapers. The latter company will be known hereafter as the SMITH & MILLS DIVISION OF THE HAMILTON-THOMAS CORPORATION, and its line of shapers will continue to be produced at the Hamilton, Ohio, plant of the parent corporation. The new division will be operated under the supervision of W. G. ROSENDAHL, vice-president of the machine tool branches of the Hamilton-Thomas Corporation.

G. A. GRAY CO., 3611 Woodburn Ave., Cincinnati 7, Ohio, builder of planers, planer type milling machines, and horizontal boring machines, announces the appointment of the following firms as distributors for the company's line of machine tools: FORD MACHINERY CO., Monroe at 17th St., Toledo 2, Ohio; FRANK T. GOETZ MACHINERY, INC., N.B.C. Bldg., Cleveland 14, Ohio; MARTIN SUPPLY CO., 710 Daniel Bldg., Tulsa 1, Okla.; and HOFFMAN & HEARTT, 2011 Santa Fé Ave., Los Angeles 21, Calif.

WARNER & SWASEY CO., Cleveland, Ohio, announces the removal of its New England district office from Kendall Square Bldg., Cambridge,

(Left) Carl F. Roby, recently elected director of the Cincinnati Milling Machine Co. (Right) Swan E. Bergstrom, new vice-president

Mass., to 20 Chestnut St., Needham 92, Mass., a suburb of Boston. The company's Buffalo office has also been moved from its previous location in the Iroquois Bldg. to the Vars Bldg., 344 Delaware Ave.

ELMER W. KRUEGER has recently been named operations manager of the Cleveland Pneumatic Tool Co., Cleveland, Ohio. Mr. Krueger has been connected with the company since 1922, and prior to his present promotion, held the position of general manager of sales administration. JOHN M. CHAPMAN will succeed Mr. Krueger in that post.

J. TEDFORD BACHMAN has resigned as assistant vice-president of operations of the Sharon Steel Corporation to become general manager of sales for the Cold Metal Products Co., Youngstown, Ohio, producer of cold-rolled carbon, alloy, and stainless strip steel.

SCHAUER MACHINE CO., Cincinnati, Ohio, manufacturer of a line of speed lathes for finishing operations, bench grinders, battery chargers and eliminators, test instruments, etc., announces that the company name has been changed to the SCHAUER MFG. CORPORATION.

AMERICAN INSTITUTE OF BOLT, NUT, AND RIVET MANUFACTURERS announces that its name has been officially changed to the INDUSTRIAL FASTENERS INSTITUTE. The headquarters of the organization remain at 1550 Hanna Bldg., Cleveland, Ohio.

JOHN J. RADIGAN has been made director of industrial relations for the E. W. Bliss Co., Toledo, Ohio. Mr. Radigan has been associated with the company since 1946, and was previously assistant director of personnel of all plants.

ROBERT F. HODGSON has been appointed chief engineer of the Hydraulic Equipment Co., Cleveland, Ohio. He has been associated with the company for four years, serving in the engineering and sales departments.

Pennsylvania

DORMAN MACHINE TOOL WORKS, Mount Vernon, N. Y., and THRIFTMASTER PRODUCTS CORPORATION, Lancaster, Pa., have consolidated their manufacturing and sales activities. Hereafter the complete lines of Dorman tapping attachments and Thriftmaster adjustable- and fixed-center drill heads will be manufactured at the Thriftmaster plant, 1034 N. Plum St., Lancaster. WALTER E. DORMAN has been appointed general sales manager of the Thriftmaster Products Corporation.

LANDIS MACHINE CO., Waynesboro, Pa., announces that the present manufacturing, research, and office facilities of the company are being increased by approximately 50,000 square feet, and a number of new machines and tools are being installed to meet the increasing demand for the company's line of threading equipment.

A. E. BARKER, former mid-eastern district sales manager of the Firth Sterling Steel & Carbide Corporation, McKeesport, Pa., has been promoted to the position of assistant to the recently elected president, J. W. KINNEAR, JR. Mr. Barker has been connected with the Firth Sterling organization for forty-three years.

TOMLINSON FORT has been appointed manager of the apparatus sales department of the Westinghouse Electric Corporation, Pittsburgh, Pa. WILLIAM W. SPROUL has been made sales manager, industrial products, and ROYAL C. BERGVALL engineering manager, industrial products.

JAMES H. JEWELL, former manager of apparatus sales of Westinghouse Electric Corporation, Pittsburgh, Pa. and JOHN M. MCKIBBIN, assistant to the vice-president and manager of advertising and sales promotion, have been elected vice-presidents of the corporation.

GEORGE S. GRASSMYER has been appointed manager of inspection of the Eddystone Division of the Baldwin Locomotive Works, Philadelphia, Pa. He has been connected with the Baldwin organization since 1941 in the field service and inspection department.

KEN JACKSON has been appointed sales representative in the state of Pennsylvania for the Camcar Products Co., Rockford, Ill., manufacturer of cold upsetting and threading machines. He previously represented the American Screw Co.

ELECTRIC INDUSTRIAL TRUCK ASSOCIATION announces the removal of its executive offices to 3701 N. Broad St., Philadelphia 40, Pa. WILLIAM VAN C. BRANDT is the new managing director and secretary-treasurer of the Association.

Texas and Georgia

MICHIGAN TOOL CO., 7171 E. McNichols Road, Detroit 12, Mich., has appointed DOLAN INDUSTRIAL SALES, 318 Union National Bank Bldg., Houston 2, Tex., representative of the company in southern Texas.

CHARLES PINGRY has been appointed district sales engineer at Dallas, Tex., for the Chain Belt Co., Milwaukee, Wis., manufacturer of chain and transmission, conveying and process equipment.

CARBOLOY COMPANY, INC., Detroit, Mich., has appointed the PYE-BARKER SUPPLY CO., 231 Pryor St., S.W., Atlanta 3, Ga., distributor for the company's line of tools in the Atlanta and northern Georgia area.

Vermont and Rhode Island

FELLOWS GEAR SHAPER CO., Springfield, Vt., announces the following changes in its sales organization: CECIL M. PETER, who for nearly eleven years has been general sales manager, becomes vice-president and general manager; LEROY C. KING, eastern district sales manager for a number of years, has been made sales manager, with headquarters at New York, and will be succeeded as eastern district manager by HERBERT W. NICKERSON; FRED PAULING will assist Mr. Nickerson at the New York office; RALPH LANE succeeds Mr. Pauling as representative in the Boston area, and RALPH AIKEN succeeds Mr. Lane in the Syracuse territory; GEORGE SANBORN becomes manager of the Detroit office, retaining his title as chief field engineer; FRANK SANBORN will be located on the West Coast, with headquarters in Los Angeles, where he will work as salesman with the company's distributors in that area. CARL RICE becomes assistant to GEORGE SANBORN in field engineering, succeeding FRANK SANBORN.

FEDERAL PRODUCTS CORPORATION, 1144 Eddy St., Providence 1, R. I., announces the removal of its Los Angeles branch office to 1308 Magnolia Ave., Los Angeles 6, Calif., and of its Cleveland branch office to 1511 Warrensville Center Road, Cleveland 21, Ohio.

* * *

Gear Design Specification Sheets

The Auto Engine Works of St. Paul, Minn., has prepared a set of specification sheets for convenience in designing and specifying gears. Each sheet includes a line drawing of one type of gear and a list of various specifications, such as number of teeth, pitch, bore, material, etc., with blank spaces opposite each which can be quickly filled in with the required figures. The set includes sheets for spur, herringbone, helical, bevel, internal, and miter gears. A complete set of these sheets is available without cost to gear designers or others whose work involves the specifying of gears by writing Dewey Hult, Auto Engine Works, 349 N. Hamline Ave., St. Paul, Minn.

Cut YOUR COST PER PIECE WITH SHEFFIELD PRECISIONAIRES

and keep quality competitive

Precisionaires positively measure internal and external dimensions to the accuracy required on the production line, in the toolroom, or in the laboratory.

These trustworthy instruments for reliable dimensional control are universally used for cutting costs and protecting quality. They speed up inspection time and cut the cost of gages.

Scrap is reduced—more good parts are accepted—assembly time is cut—inspection costs go down—quality goes up.

NEW FEATURES

- Linear Column
- Linear Scale
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- Float Positioner
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- Dual Control of Air Flow
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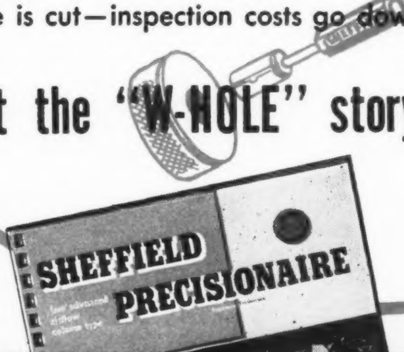

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Send this coupon for new 28 page Precisionaire Application Handbook and see how users are cutting costs per piece while maintaining competitive quality.

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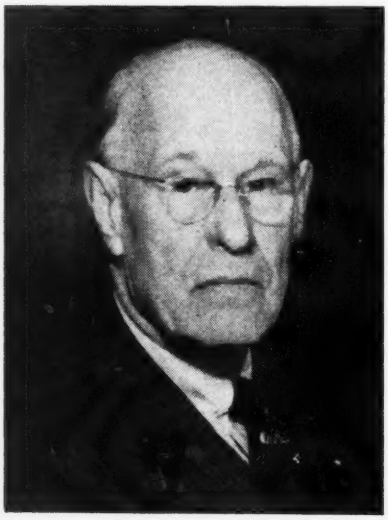
GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

Obituaries

Harold C. Bullard

Harold C. Bullard, plant engineer of the Bullard Co., Bridgeport, Conn., died at his home in Fairfield on June 28, following a heart attack. Mr. Bullard had been associated for forty-five years with the Bullard Co., of which his father was the founder. He was born in Bristol, Conn., on August 14, 1879, and graduated from Pratt Institute in Brooklyn, N. Y., in 1900 with an engineering degree as an architect. In 1904, he joined the Bullard Co., but left shortly thereafter to take an engineering position with the Berlin Bridge Co., of Berlin, Conn. He was later employed by the F. W. Robinson Co. of New Haven as supervisor of engineering. In 1912, Mr. Bullard returned to the Bullard Co. as a member of the mechanical engineering department, and was made plant engineer in 1921, which position he held until his death. He also served for many years as a member of the board of directors, from which he retired in March, 1948.



Harold C. Bullard

Edwin C. Shultz

Edwin C. Shultz, advertising manager of Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., died on July 5 at his West Hartford home after a brief illness. He was fifty-one years of age.

Mr. Shultz was born in Brooklyn, N. Y. He attended the Massachusetts Institute of Technology and the Stevens Institute of Technology, graduating from the latter institution in 1922. On July 5 of that year he joined the old Pratt & Whitney Co., now a division of the Niles-Bement-Pond Co. Having the ability to apply the English language in a clear, concise manner to technical subjects, he was assigned to advertising work, and became widely known throughout the industrial publishing field.

Edwin C. Shultz

Mr. Shultz served with the 56th Engineers of the U. S. Army in World War I. He was a member of the Hartford Advertising Club and a director of the Western New England Chapter of the National Industrial Advertisers Association.

William H. Bahan, president and treasurer of the Bahan Textile Machinery Co., Greenville, S. C., died at a hospital in Greenville on June 29 from injuries sustained in an automobile accident near his plant a few days previously. Mr. Bahan was a native of Huntington, Mass., but had lived in Greenville for the last twenty-eight years. He was sixty-seven years old. He founded the Bahan Textile Machinery Co. in Charlotte, N. C., in 1917 and had served as its president ever since. The plant was moved in 1921 to Greenville, S. C.

Mr. Bahan was well known in the textile field as an inventor and manufacturer, and had developed many labor-saving devices for use in his own plant and for many of the textile mills throughout the country.

Clifford R. Ramage, vice-president and director of purchases of the Diamond Chain Co., Inc., Indianapolis, Ind., died suddenly on June 22 in the Stevens Hotel at Chicago. Mr. Ramage was born in Pittsburgh, Pa., and had been associated with the Diamond Chain Co. for thirty-nine years. He is survived by his wife and a son.

Coming Events

August 15-17—National West Coast Meeting of the Society of Automotive Engineers at the Multnomah Hotel, Portland, Oreg. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

September 12-16—Fourth National Instrument Conference and Exhibit in the Municipal Auditorium, St. Louis, Mo.

September 21-24—Twenty-sixth annual convention of the National Association of Foremen at the Statler Hotel, Detroit, Mich. Headquarters of the Association, 321 W. First St., Dayton 2, Ohio.

September 26-28—National Electronics Conference at the Edgewater Beach Hotel in Chicago, Ill. Sponsored by the Illinois Institute of Technology, Chicago 16, Ill.

October 10-14—National meeting of the American Society for Testing Materials in San Francisco, Calif.; headquarters, Fairmont Hotel. Headquarters of the Society, 1916 Race St., Philadelphia 3, Pa.

October 17-21—National Metal Congress and Exposition to be held in connection with the thirty-first annual meeting of the American Society for Metals at the Public Auditorium in Cleveland, Ohio. National secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

October 17-21—Fall meeting of the Metals Branch, American Institute of Mining and Metallurgical Engineers, in Cleveland, Ohio. Secretary, E. H. Robie, 29 W. 39th St., New York 18, N. Y.

October 17-21—Annual meeting of the American Society for Metals in Cleveland, Ohio. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

October 17-21—Annual meeting of the American Welding Society in Cleveland, Ohio. Executive secretary, Joseph G. Magrath, 33 W. 39th St., New York 18, N. Y.

October 23-28—Thirty-seventh National Safety Congress and Exposition in Chicago, Ill. R. L. Forney, general secretary, National Safety Council, 201 N. Wacker Drive, Chicago 6.

October 27-29—Seventeenth semi-annual meeting of the American Society of Tool Engineers at the Mount Royal Hotel, Montreal, Canada. Executive secretary, H. E. Conrad, 10,700 Puritan Ave., Detroit 21, Mich.

New Books and Publications

ESTIMATING MACHINING TIMES. By T. W. Gorgon. 163 pages, 5 1/2 by 8 1/2 inches. Published by the Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. Price, $2.75 (in the United States). Available from The Industrial Press, 148 Lafayette St., New York 13.

Rate fixers and others concerned with the calculation of production time will find useful data and instructions in this little handbook that should enable them to estimate machining times accurately and quickly. The information has been compiled from many sources and from the results of experiments carried out by the author. Charts are given for figuring set-up times, speeds and feeds for various materials, and other data needed in estimating the time required for performing the basic machine tool operations of turning, milling, drilling, and grinding. Chapters explaining in detail the use of the various charts are included. The text describes the general principles of estimating, methods employed, formulas, and the preparation of graphs and charts. The preliminary chapter contains general data such as is used in estimating most types of machining operations, including weights of materials, approximate relations between various hardness scales, English steels and their American equivalents, manufacturing tolerances, etc.

MACRAE'S BLUE BOOK. 3848 pages, 8 1/4 by 11 inches. Published by MacRae's Blue Book Co., 18 E. Huron St., Chicago 11, Ill. Price in the United States, $15; foreign countries, $20.

This is the fifty-sixth edition of an annual directory of American industry covering all the manufactured products in the United States. The arrangement is the same as in previous editions. There are three main sections. The first contains an alphabetical list of the names and addresses of all manufacturers of the various products, including local distributors. The classified material section—the main part of the book—contains over 3000 pages, and lists all manufacturers of a given product under the name of the product. These classifications are subdivided, so that it is easy to locate the manufacturer of the particular type of equipment desired. Under the product classifications the names of the companies are arranged alphabetically. The last section of the directory comprises an alphabetical list of trade names of the products included in the classified material section. Sales departments, purchasing agents, and everyone who needs to make up a list of industrial concerns or products for any purpose will find this guide a valuable aid.

STANDARD WELDING TERMS AND THEIR DEFINITIONS. 50 pages, 6 by 9 inches. Published by the American Welding Society, 33 W. 39th St., New York 18, N. Y. Price, $1.

The American Welding Society has spent four years formulating a standard terminology for welding, which has now been made available. The standard contains more than 500 terms and 57 illustrations. An important aspect of the work involved in preparing these standard terms was the necessity of verifying that basic terms were equally applicable to all welding processes. This led to the preparation of a "Master Chart of Welding Processes," listing all 37 welding processes in commercial use today, together with Process Charts comparing the various processes. The master chart and process charts can be obtained in connection with the booklet on standard welding terms at a combination cost of $1.25 for both; the cost of the set of charts purchased separately is 35 cents.

* * *

German Technical Magazines Resume Publication

During the war the magazines *Werkstattstechnik und Werksleiter* and *Maschinenbau der Bertrieb* were combined and the last issue of the combined magazine appeared in October, 1944. Announcement has now been made that publication of these two magazines has been resumed and will be continued in the future under the name *Werkstattstechnik und Maschinenbau*. This magazine, which is devoted to manufacturing problems in the building of machines and apparatus, as well as precision mechanics, is published by Springer-Verlag, Jebensstrasse 1, Berlin-Charlottenburg 2, Germany, and is issued monthly.

* * *

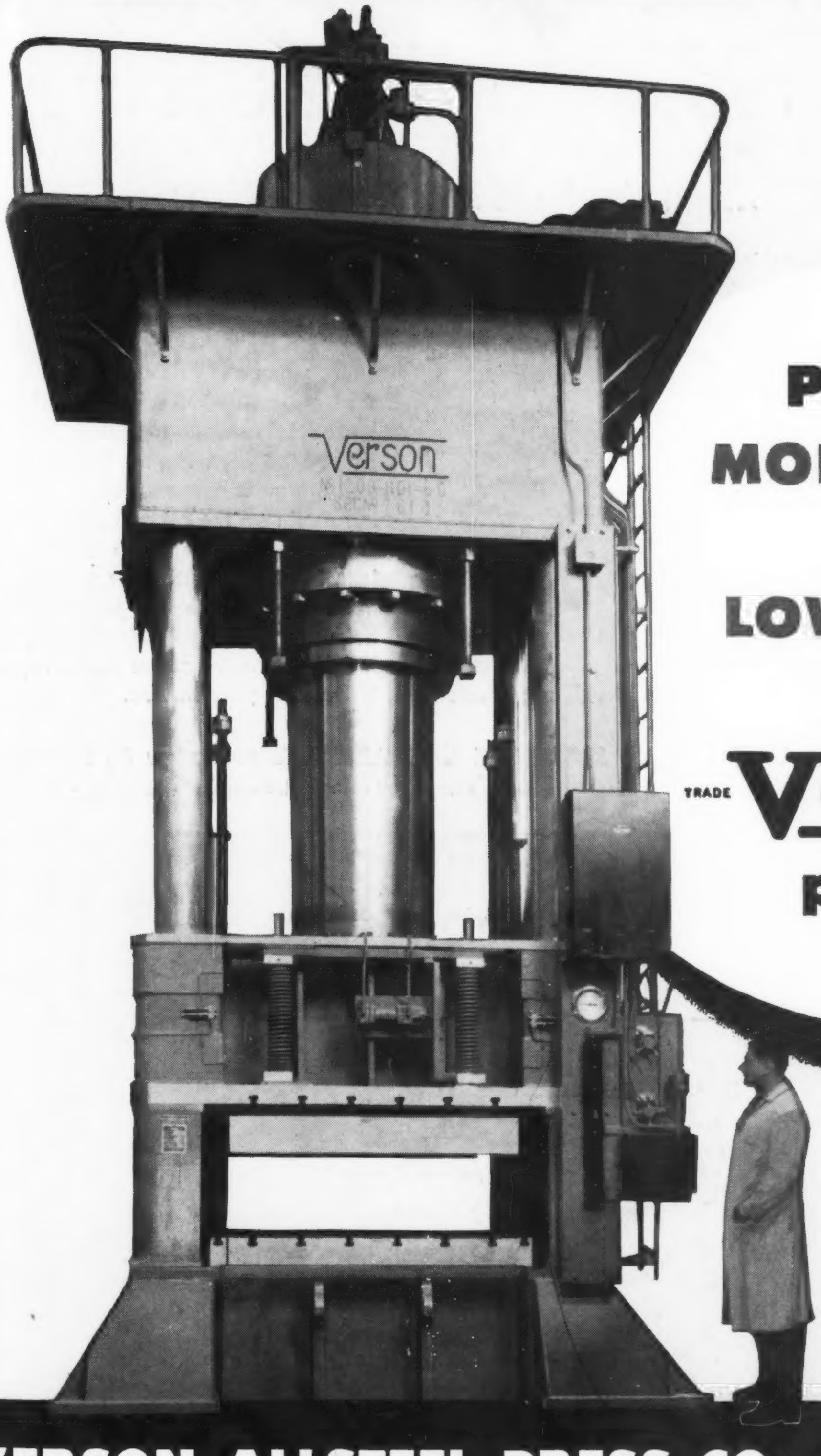
Morse Twist Drill Co. Awards Prizes for Name of New Drill

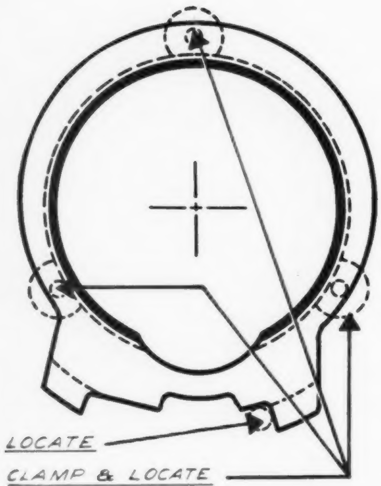
The Morse Twist Drill Co., New Bedford, Mass., announces the award of prizes in the contest recently sponsored by the company for the best name for the new high-production Morse drill. Robert B. Ketterer, of Karl Lieberknecht, Inc., Reading, Pa., won the first prize of $1000 for suggesting the name "Ambore," and George L. Sincell, of Joseph Woodwell Co., Pittsburgh, Pa., was awarded the second prize of $200. Other prize winners received sets of the new "Ambore" drill. Nearly 15,000 entries were received from all over the country.

George H. Johnson, president of the Gisholt Machine Co., congratulating two employes upon the completion of fifty years' service with the company, after presenting them with diamond pins and gold watches. (Left to Right) David Wright and Edward Johnson, recipients of the awards; S. John, vice-president of Gisholt Machine Co.; and George H. Johnson, president of the company

AUGUST 1949 — FIFTY-FIFTH YEAR

MACHINERY





Detail of overdrive balk ring, showing clamping and locating arrangement and surfaces bored and chamfered in a single high-speed automatic cycle.

Production of Overdrive Balk Rings

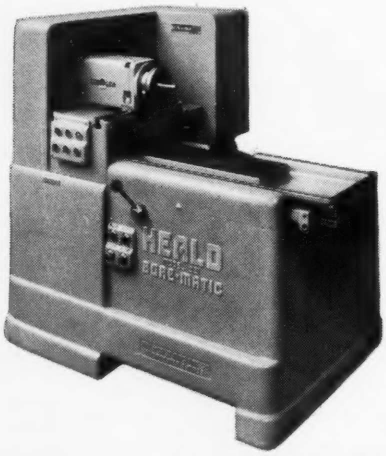
INCREASED FROM 1200 TO 2000 PIECES PER SHIFT

...on a New Heald Model 221 Bore-Matic

When this new Heald machine took over the job of borizing overdrive balk rings, production went up almost 100 per cent. What's more, the customer reports that the operator and foreman are greatly pleased with the equipment—because it's easier to operate, easier to set tools, easier to load and unload. And they particularly like the efficient guarding that keeps the coolant from spattering up the machine and the operator.

This Model 221 Bore-Matic is arranged with a quick-acting hydraulic clamping fixture for boring and chamfering two parts simultaneously. An unusual feature of this machine is the unique feed-out quill arrangement. As the table travels to the left, the quills bore and plunge chamfer on the back side of the part. Then, when they have traveled beyond the bore, a stud in the fixture pushes them back and outward to chamfer the front side of the part. The table then reverses and the quills automatically retract, boring again on the return table stroke.

If you have a precision finishing problem, in either borizing or grinding, why not let Heald engineering and experience help you do the job faster, easier, and at lower cost. Your nearest Heald representative is at your service.



For this operation, the Heald Model 221 Bore-Matic is equipped with a two-station hydraulic clamping fixture, dual boring-heads, and special feed-out quills, as shown below.

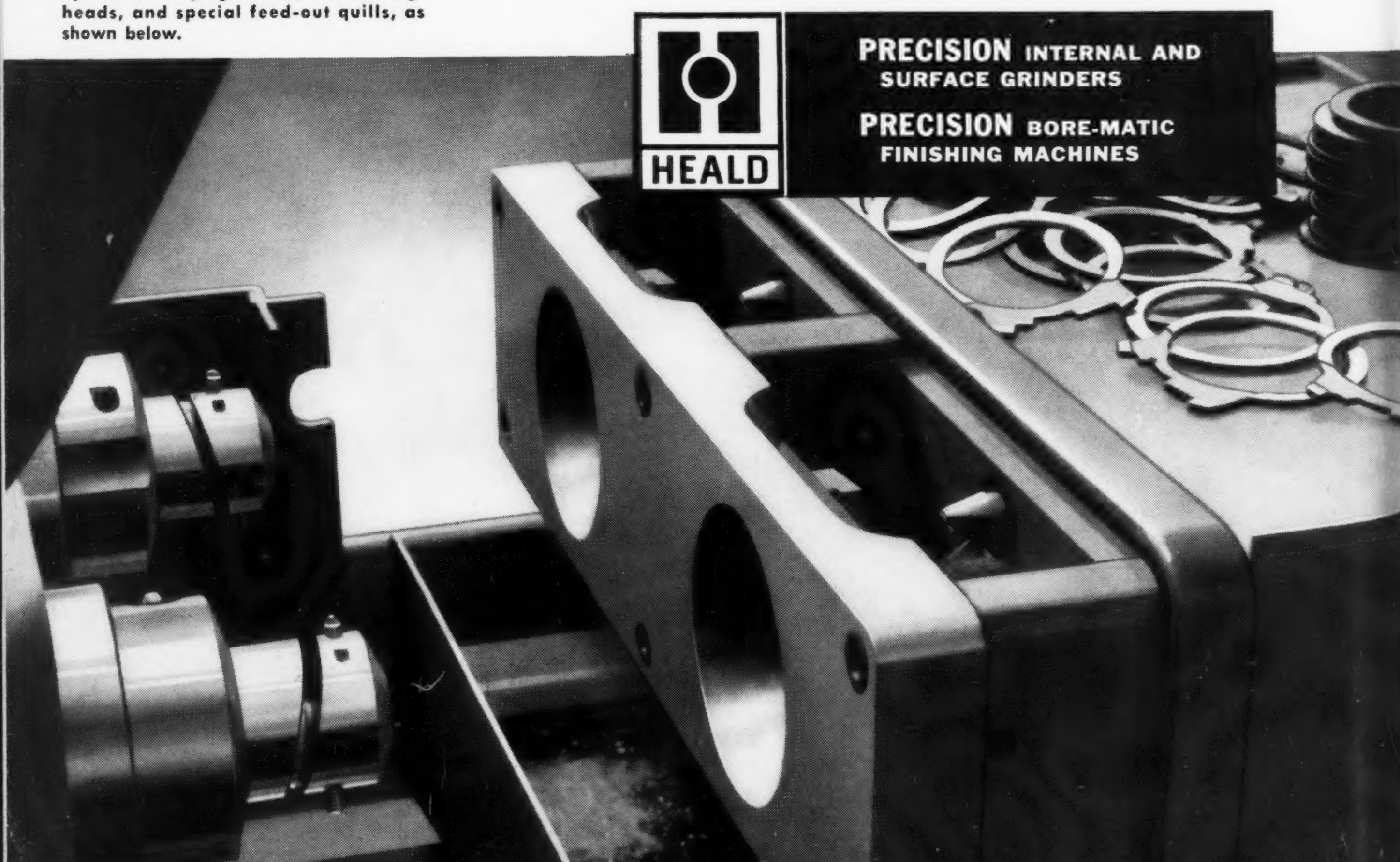
THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES



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